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FACTS

FROM THE

WORLD OF NATURE,

ANIMATE AND INANIMATE.

BY MRS. LOUDON,

AUTHOR OF

"THE LADIES' COMPANION TO THE FLOWER GARDEN,"
"GLIMPSES OF NATURE," &c. &c.

"Who is it speaks these wonders, and they be?
Who is it, dread Omnipotent, but thee!
Thou badest the unpillared skies their arch expand—
Thy breath is underneath them, and they stand;
Thou badest the sea in tides to rise and fall,
And earth to swell triumphant over all.
Thy mercy, co-eternal with thy skill,
Saw all was good, and bids it flourish still!"

CLARE.

WITH AN ENGRAVING ON STEEL, AND NUMEROUS
ILLUSTRATIONS ON WOOD.

LONDON: GRANT AND GRIFFITH,

SUCCESSORS TO

JOHN HARRIS, CORNER OF ST. PAUL'S CHURCH-YARD.

M.DCCC.XLVIII.



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TO
CHARLES WATERTON, ESQ.,
OF WALTON HALL.

MY DEAR SIR,

The kindness with which you, in the time of my utmost need, overcame the reluctance you had to appearing again in print, and presented me with a second series of your charming *Essays*, sank so deeply into my mind, that I have ever since longed for an opportunity publicly to express my gratitude. That opportunity now presents itself, as you have just added to my other obligations the permission to dedicate to you this little work, which, unworthy as it is of the honour of bearing your name, I trust you will accept as the sole compliment I have it in my power to offer you.

I am, my dear Sir,
Yours most sincerely and gratefully,
J. W. LOUDON.



PREFACE.

IN the present volume, an attempt has been made to present to the youthful reader, in as attractive a manner as possible, the Wonders of Creation as discoverable in the Physical World, and in the forms and habits of Birds, Beasts, and Fishes. It was originally intended to add Reptiles, Molluscs and Crustaceous Animals, Insects, and Plants; but as these subjects are too extensive to be compressed into narrow limits, it has been thought better to confine the work to a few subjects, treated upon at length, than to run the risk of making the whole book dry and uninteresting by too much compression.

In writing this Book, it has been my most earnest wish to cultivate and strengthen that love of nature which seems inherent in every youthful mind before it is dulled, and sometimes effaced, by intercourse with the world. The study of nature is not only interesting, but highly important to be presented to young people, as it has a tendency to enlarge and elevate the mind, as well as to develop the thinking and reasoning faculties. No one can ever have visited a mountainous country, or even have gazed on the ocean, without feeling impressed with lofty and sublime ideas, before which all the petty jealousies and vanities of life appear poor and contemptible; and if such is the effect

of nature upon a mature mind, how much more vivid must be its effects on the yielding and impressible mind of childhood! It is necessary, however, for a child to know something of natural objects, before he can feel an interest in them; and if this book contributes to awaken that interest, the object of its author will have been attained.

J. W. L.

BAYSWATER, October 16, 1847.

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F A C T S

FROM THE

WORLD OF NATURE.

BOOK I.

WONDERS OF THE EARTH.

THE wonders of the earth comprise the remarkable mountains, rocks, and deserts, which are found on its surface; and the caverns, mines, and fossils, which are hidden in its recesses:—but before any attempt is made to describe these, it may be well to say a few words on the construction of the earth itself.

It is first necessary to observe, that all which is known by geologists respecting the construction of the earth, is confined to its outside, or crust. The earth itself is eight thousand miles in diameter: and of the centre of this mass we know nothing. The deepest mine that has ever been dug does not reach perpendicularly much more than a quarter of a mile; the sea is seldom found deeper than a mile and a half; and the loftiest mountains do not rise five miles above the level of the ocean.

The surface of the globe is, as is well known, very unequal; by far the greater part is hollowed out

and filled with water; but the remainder is dry land, which, in many places, rises into rocks and mountains. The level part of the earth is generally covered with a loose fertile soil, but when an excavation is made to any depth, (as was lately shewn conspicuously in many places in the cuttings for railways,) it is found that the soil in the fields, and other cultivated places, is never more than a few feet deep, and below it lie rocks or earths of different kinds, which are generally disposed in layers or strata, easily distinguished by their colour and texture.

As it is not intended in this work to enter into any details respecting geology, a science still involved in considerable difficulty, it will be sufficient here to observe, that some kinds of rock are of a much firmer texture than others; and are less easily affected by the influence of the weather. The hardest rocks appear to have been subjected to the action of fire, by which they have been partially crystallized. Other rocks seem to have been subjected to both fire and water; and others have been evidently produced by volcanoes. Most of the large mountains are formed of granite, which is the hardest of all rocks, and which has, consequently, been least diminished by the influence of the atmosphere. Caverns are generally found in limestone rocks; and extraordinary forms are discoverable in those rocks which are either of recent volcanic origin, or formed of two kinds of stone, one much softer than the other. Everywhere we find traces of the mighty convulsions to which the earth has been subjected; but everywhere we also find proofs of the wisdom and goodness of that Almighty Being, who made both the Heavens and the Earth, and saw that all was good.

CHAPTER I.

MOUNTAINS.

OF all the natural wonders of the world, mountains claim the preeminence from their magnitude and grandeur. They differ from hills principally in size ; and also in the fact, that mountains are never found to stand alone, unless they are volcanoes, or clearly of volcanic origin, but always form groups, or ridges, which often extend for hundreds of miles. These mountain ridges, or chains, as they are generally called, do not present one continuous line, but are generally broken into pointed summits like the Alps, especially when their tops are always covered with snow. Sometimes the summit of a mountain is flat ; and when this kind of elevated flat land is of considerable extent, as at the Cape of Good Hope, in central Asia, and in Mexico, it is called Table-Land. In other cases the summit of the mountain is curved like a saddle, or slightly rounded at the top, the latter being the form most common to hills, or mountains of moderate height. Besides these forms, which are the most common, the summits of mountains are frequently broken into various irregular shapes, according to the nature of the rocks of which the mountain is composed, and their capability of resisting the influence of the weather ; or because they have been erupted by a volcano, the latter being supposed to be the origin of many of the masses of rock, which now present the most remarkable forms.

ASIATIC MOUNTAINS.

THE mountains of Asia are extremely numerous, and some of them are of stupendous height. Central Asia, in fact, is a vast platform, of irregular figure, raised to a great height above the surrounding country, and bounded on every side by an immense mountain wall, formed of enormous rocks and peaks, which tower into the regions of perpetual snow. The table-land, which these mountains seem to enclose, is called Tartary, and is almost 1,200 miles in length, and 2,000 in breadth, standing generally at a level of 15,000 feet above the sea, and thus forming the largest tract of elevated ground which is to be found in the whole globe. The southern boundary of this platform consists of the great range of the Himalaya, or Snowy Mountains, one of which is the loftiest in the world; and this ridge joins that of Hindoo Coosh. On the north is found the vast range of the Altai Mountains, which, at their western extremity, join the Ural range. To the west is a range of lower mountains, ending in Mount Caucasus; and to the east are other mountains extending into China, which are at present very little known. On the other side of the mountains the land in general slopes down to the sea; and thus the climate of the different parts of Asia does not entirely depend on the position of each place with regard to the equator, as the elevated land of Tartary is much colder than the low lands of Arabia and Persia on one side, and of

China and Japan on the other, which lie nearly between the same degrees of latitude.

The most remarkable of the Asiatic mountains are the Himalayas, Adam's Peak, Mount Caucasus, and Mount Lebanon with the other mountains mentioned in Holy Writ.

THE HIMALAYAS.

THE Himalayan mountains form a chain nearly a thousand miles in length, and about a hundred and fifty miles in breadth. They consist in many places of rugged and bare rocks, shooting aloft into the sky, and divided by deep ravines, often ending in dark chasms, which are sometimes wooded, but in other cases totally devoid of vegetation, as if they had been worn by torrents. "Here," says a writer on the subject, "is concentrated all that is sublime in the scenery of nature. On every side rise snowy summits of stupendous height, and various forms, mingled with conical volcanic peaks, regularly rounded hills, and rugged and frightful precipices."

In some places, "the traveller has to scale the most terrific heights by a path so narrow as not to admit two abreast, which winds along the mountain, and often along bare and perpendicular precipices, by a narrow and irregular flight of steps, or by natural irregularities in the face of the polished marble rock, and sometimes by a projecting ledge not more than a foot broad, whilst a declivity of 600 or 700 feet in depth opens on the outer side. The steps, at certain projecting points, where the rock is perpendicular, wind in lines of



zigzag, not more than ten or twelve feet in length, at angles so sharp that, in a length of twenty-four feet, the actual height gained is not more than ten feet; and they are often placed at most inconvenient distances, which greatly increases the danger and difficulty of access."

In some places these paths would be quite inaccessible, if it were not for the help of the natives, who carry travellers in wooden chairs upon their backs. Even with this assistance we may easily imagine the terror and inconvenience to which travellers are exposed in

traversing those fearful regions. Exposed alike to the burning heat of the sun, and to piercing winds which come laden with cold from sweeping over the masses of snow which cover lofty mountain peaks even in the hottest regions; oppressed with a difficulty of breathing, which is always felt as we ascend higher into the atmosphere, and the air becomes more rarefied; and giddy with looking down frightful precipices, we may almost wonder how human beings can ever live through the perils of such a journey, particularly Europeans, who have not had their sense of the dangers to which they are exposed lessened by the force of habit. Yet we find every day the restless energy of the human mind overcoming personal fear, and men encountering the most fearful risks from the love of fame—the wish to acquire money, and sometimes merely from curiosity. Youth and strength have a pleasure in conquering difficulties; and a love for travelling seems almost inherent in some active minds. Mountain scenery is also inexpressibly grand; and man seems brought nearer to his Creator when surveying these gigantic proofs of the Almighty Power. It is, perhaps, from some feeling of this kind, that we generally find lofty mountains the resort of pilgrims; who, though they repair there ostensibly to offer homage to different deities, must, in such places, all feel impressed with one sentiment, namely, the feebleness of man, when compared with the majesty of nature. How poor and insignificant, indeed, must the petty struggles of humanity appear amidst these tremendous mountains, where, as Bishop Heber tells us, “the horizon is terminated by a vast range of ice and snow, extending its battalion of white and shining spears from east to west as far as

the eye can follow it; the principal hills rising like towers in a glittering rampart."

The Himalayas are traversed by means of what are called ghauts or passes; and which, though they are sunk like valleys among the peaks, are yet at the enormous height of from 3000 to 4000 feet above the level of the sea; or about the same height as the summit of the loftiest Scotch and Welsh mountains. The ghauts are generally free from snow, and are frequently covered with the richest vegetation, while the lofty peaks which rise on each side, and all that are around and above them, are glittering with ice. Whenever an opening occurs in the rocks, a long vista of icy peaks is seen glistening in the sun, and reflecting a thousand brilliant colours; and these are so distinct, and stand so boldly out from the clear blue sky behind them, that peaks of remarkable form and height have been seen and recognized at the distance of 150 miles.

The highest mountains of the Himalayas are called Chumularee, and Dhawala-giri, or the White Mountain; and as both these are between 28,000 and 29,000 feet high, they are supposed to be the loftiest mountains in the world. Neither of them have yet been ascended; and, indeed, from the steepness of their sides, and their enormous height, it seems almost impossible that any ordinary mortals should possess sufficient strength to reach their summits.

The valleys of the Himalayas are covered with wood, and some of the finest pines and firs we possess have been brought from them; the rocks are also frequently covered with splendid Orchideous plants of the richest colours and most fantastic forms. The birds and insects are also of splendid colours.

The meaning of the word Himalaya is seat of snow, in allusion to the eternal snows which rest on the highest summits of the peaks.

ADAM'S PEAK.

ADAM'S PEAK is a mountain of a very peculiar shape ; and forms the highest pinnacle of a mountain range situated in Ceylon, about thirty miles from the city of Kandy. It has seldom been ascended by Europeans, but in 1829 Mr. Marshall, accompanied by a friend, succeeded in reaching the top, and the following description is abridged from the account published of their journey. "On approaching the mountain they saw a few huts of the natives built on the extreme jagged points of the lower hills, in order to escape the elephants, and for some distance their pathway lay along the ridge of a narrow hill, on each side of which flowed a river." These rivers at some places fall over stupendous precipices, forming cascades of great magnitude. From the height of one of these cascades, the whole mass of water which passed over the rock seemed to rise again in white vapour. Above these impetuous rivers rose lofty ranges of peaked mountains, the whole presenting one of the most magnificent pictures in the world. The peak has always been considered by the natives as a Holy mount, and pilgrimages were very often made to it; the returning pilgrims, as an act of charity and duty, disposing of their walking staves on the face of the hill, so as to assist future travellers in their ascent. When Mr. Marshall came to a very steep part of the road, he found a succession of these walking sticks stuck firmly into the earth, and bundles

of rods laid horizontally behind them, by which means tolerable steps were formed. As, however, pilgrimages by the road they came had wholly ceased since the dominion of the English, all these conveniences were rapidly going to decay.

On reaching the top of a very high hill, the travellers had a near view of the peak, which rose before them like an enormous pointed minaret. They now ascended the dry bed of what was a torrent in the rainy season, and found that a thick jungle and lofty trees threw a wild gloom over their path. The upper part of the peak consists of an immense cone of granite very slightly covered with vegetation. The track over this cone is quite abrupt, and where the pathway leads over a bare rock, bordering some fearful precipice, there are steps cut in the stone, and iron chains so fixed as to lie along the steps, for the purpose of assisting passengers in ascending and descending. When Mr. Marshall and his friend reached the top of the cone, they found "that its narrow apex, which was only twenty-three paces long by eighteen broad, was surrounded by a wall, in which there were two distinct openings to admit pilgrims, corresponding with the two tracks, by which alone the mountain could be ascended. The elevation of this apex is 6800 feet above the level of the sea; the granitic peak or cone resting upon a very high mountain, belonging to the chain which forms the rampart of the upper country. Nearly in the centre of the enclosed area they saw a large rock, one side of which is shelving, and can be easily ascended. On the top of this mass, which is of granite, there stands a small square wooden shed, fastened to the rock, as also to the outer walls, by means

of heavy chains. This security is necessary to prevent the edifice being hurled from its narrow base by the violence of the winds." The roof and posts of this little building, which is used to cover the *Sri Pade*, or holy foot-mark, were adorned, when Mr. Marshall saw it, "with flowers and artificial figures made of pieces of coloured cloth; the impression of the foot they found to have been made in part by the chisel, and partly by elevating its outer border with mortar; and all the elevations which mark the spaces between the toes of the foot have been made by lime and sand. The impression, which is five and a half feet long, and nearly two feet deep, is encircled by a border of gilded copper, in which are set a few valueless gems. This foot-mark is an object of deep reverence by the pilgrims, some of whom believe it to be that of their god Buddhoo; but the Arabs attribute it to Adam, our first father; and hence the name of the mountain." Mr. Marshall and his friend remained on the peak all night to watch the singular atmospheric effects attendant on the rising of the sun in the morning. "By midnight," he observes, "the clouds had subsided to the lower strata of the atmosphere, and appeared to be all lying on the surface of the earth. The moon shone bright, by which means we had a magnificent view of the upper surface of a dense stratum of white fleecy cloud. It is impossible to convey in words the grandeur of the scene. The surface of the earth was overspread with a covering resembling the finest white down, through which many dark coloured mountains and cliffs projected. Could we conceive a white sea studded over with islands, extremely various in size and figure, a faint idea might be formed of the prospect from the peak during the

night. When the sun rose, the shadow of the peak appeared like an immense cone or triangle stretching to the edge of the western horizon, but by degrees the base of the shadow approached the foot of the mountain." The travellers descended the cone by the opposite route, leading to Saffragam, which they found to be still more abrupt than the one by which they had ascended. In several places it led them across bare, slippery, precipitous rocks. There were no steps cut as on the other side of the cone, but in the more difficult and dangerous places there were strong iron chains fastened to the rock, to assist ascent and descent. At two or three places the view downward was grand and awful in the extreme; the cone in these places appearing to hang over the lower mountains, so that the eye glanced perpendicularly below, as though looking down into an immense pit.

MOUNT CAUCASUS.

THE Caucasian range of mountains extends from the south-east to the north-west, across the isthmus between the Black and Caspian seas. The length of this mountain chain is estimated at about 650 miles, and the breadth, though it varies considerably, is, on an average, nearly 200 miles. Torrents, precipices, and avalanches, render these mountains almost impassable, except by what are called the gates, which are elevated mountain passes resembling the ghauts of India. The loftiest mountain of the Caucasian range is Mount Elbourz, the summit of which is nearly 18,000 feet above the level of the sea, and the peak of which is covered with snow.

This mountain has a very striking appearance, both from the Russian and the Persian sides. "Imagine," says M. Kupfer, "a platform 8,000 or 10,000 feet above the level of the sea, rent in various directions by deep and narrow valleys, and traversed from east to west by a ridge of rugged and picturesque rocks, whose summits are covered with eternal snow; fancy about the middle of this ridge an excavation very broad, but not deep, the centre of which is occupied by a cone, which might be believed to be entirely formed of snow, did not the naked rock which it covers occasionally appear; this is Elbourz, whose height surpasses, by 3000 or 4000 feet, that of all the surrounding mountains."

In the Caucasian range there are glaciers, which are not found in the other Asiatic mountains, and, though there are no active volcanoes vomiting fire and lava, there are volcanoes of mud communicating with the range on the southern side.

MOUNT ARARAT.

THE whole kingdom of Armenia forms a chaos of mountains, valleys, and torrents, from the centre of which rises Mount Ararat. Its summit, which is covered with perpetual snow, appears to be in the form of a sugar-loaf rising from a lower part, which presents a formidable appearance of craggy cliffs and deep precipices. The sugar-loaf, however, when viewed from the north, is found to be divided into two peaks, separated by a deep glen in the body of the mountain; and from this deep cleft both the peaks rise in a conical shape; one being much smaller than the other. On

the north-west face of this mountain is a stupendous rocky chasm of great depth, which is perfectly black, and which contrasts in the most striking manner with the brilliant whiteness of the snowy peaks.

It was long supposed that the summit of this mountain was inaccessible ; and, indeed, though it is now said that the Russian traveller, Dr. Parrot, has ascended it, it is still doubtful whether he reached the highest summit of the mountain.

In 1700, the celebrated botanist, Tournefort, attempted the ascent ; and though he was unable to accomplish it, the account he has left of the difficulties he encountered is very interesting. From this account there appears no doubt that Ararat was once a volcano, and the deep black gulf, already mentioned, was the crater. Tournefort expressly remarks that at the beginning of the ascent, he and his party found the ground covered with loose sand, which made them feel as if they were slipping back at every step they took, and that they afterwards came to sharp fragments of stone which cut their shoes, mixed with large blocks piled on each other ; difficulties which always attend the ascent of a volcano. The Armenians believe that fragments of the ark, changed to stone, are still on the summit.

MOUNT LEBANON.

THERE are two mountain chains in Syria, one of which is called Lebanon or Libanus, and the other Anti-Libanus. The great chain of Lebanon is about 9600 feet high, and it rises to this height at the distance of sixty or seventy miles from the shore of the Mediterranean ;

the intervening country consisting of luxuriant and fertile valleys, diversified with lower ranges of hills. On reaching the foot of the mountain, the road is narrow, and often leads over craggy rocks, and the ascent becomes extremely rugged and intensely cold. The peaks of these mountains, like those of so many others, are covered with snow, which is here of tremendous depth, not being frozen, and it is consequently extremely difficult to pass. The celebrated Cedars stand at the foot of the steep declivities of the higher division of the mountain. They form a small wood of about 400 trees, standing on very uneven ground; and some of the old trees have four or five trunks springing apparently from one root. The country between the two ranges of Libanus and Anti-Libanus forms a very fertile valley, containing several towns, but planted chiefly with mulberry-trees. A very singular order of priests, called Druses, reside in these mountains. It is difficult to say what religion they profess as, though they call themselves Mahometans, they are said to practise many of the rites of Paganism. On Mount Libanus there is a monastery of Christian monks, called Marionites, from their order being dedicated to the Virgin Mary. The monks frequently make processions up the mountains; particularly when they celebrate the festival of the Transfiguration, which they do among the cedars, having built altars against several of the largest trees, where they administer the sacrament.

Lamartine, the French poet, who visited Mount Lebanon in 1832, says, "we alighted when we reached the cedars, and sat down under a rock to contemplate them. These trees are perhaps the most renowned

natural monuments in the universe: religion, poetry, and history have all equally celebrated them. The Arabs of all sects entertain a traditional veneration for them, and they attribute to them a sort of magic power. They say that some of these trees will live for ever, and that they are gifted with a kind of intelligence, which enables them to predict events; and they watch the vast boughs with anxiety, as they say, according as they incline towards heaven or earth, they can judge when the snow prepares to fall or melt." Unfortunately for the legend of the eternal duration of these trees, only seven of what may be termed the patriarchs of the forest remain, and the rest are evidently of comparatively recent date.

THE MOUNTAINS OF JUDEA.

THE largest of these is Mount Tabor, which is situated to the east of Nazareth. It is about four miles in circumference, but it rises so gradually that it may be ascended on horseback. On the top is a circular plain, which appears to have been formerly surrounded by a wall. The heights of Carmel, after running for a considerable space to the north-west terminate in a rocky promontory about 2000 feet high, running into the sea. This is Mount Carmel, and on the opposite side of the bay is Acre. Mount Zion is one of the four hills on which Jerusalem is built. Mount Hermon is a small branch proceeding from the Anti-Libanus chain; and Mount Gilead is the general name given to a group of hills in the interior of Judea.

AFRICAN MOUNTAINS.

THE African Mountains are neither very numerous nor very lofty. Those of the greatest height that are actually known, are the great cluster of the Atlas, one, chain of which runs southerly to the desert of Zahara and the other easterly to the neighbourhood of the Syrtes. The highest points of these mountains have an elevation of from 12,000 to 13,000 feet, and their peaks are covered with snow. Some cedars have been found on these mountains, closely resembling those of Mount Lebanon. The cluster of Abyssinian mountains on the opposite side of Africa, are very similar in their shape and grouping to those of Atlas; they are supposed to be about the same height, and their loftiest peaks are always covered with snow. The Kong mountains, which, in some maps, are represented as running across the continent of Africa in one unbroken chain near the equator, are of very doubtful existence, at least as to their continuity. Where crossed by Clapperton, they nowhere rose to the height of 3000 feet, but they were of granite; and a few degrees to the southward, two or three lofty peaks are visible from the sea, which appear to be from 13,000 to 14,000 feet high. Along the eastern coast a continued chain exists from the Abyssinian range to the Cape of Good Hope, but it does not appear to contain any very lofty mountains.

The Asbestos mountains, which are farther in the interior, are composed of clay-slate, with thin veins of asbestos of various colours running through them. It is curious that the name of Asbestos among the Hot-tentots signifies *handkerchief stone*.

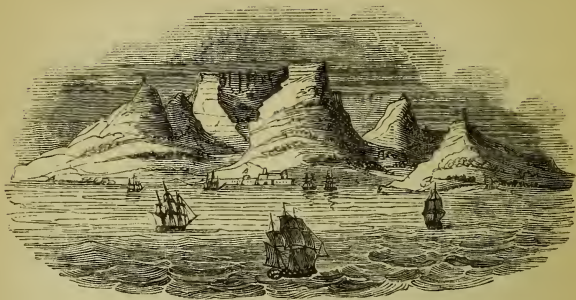
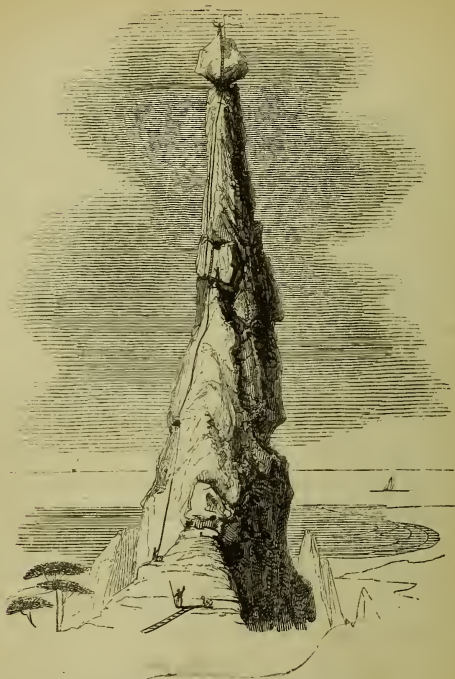


TABLE MOUNTAIN AT THE CAPE OF GOOD HOPE.

THIS remarkable mountain is about 3500 feet above the level of the sea. It takes its name from its flat top, which is about two miles in length from east to west, and a mile or something more in breadth. Before a strong south-east wind begins to blow, a thin sheet of white vapour spreads itself over the summit of the mountain, and "is seen rushing over the edge of the precipice, while the sky all around is serene and unclouded. The rapidity of its descent resembles that of water pouring over the face of a rock. The air, at the same time, begins to be agitated in the valley; and in less than half an hour, the whole town is involved in dust and darkness. Instantly the streets are deserted, every window and door is shut up, and Cape Town is as still as if it were visited by the plague. Sometimes, instead of a sheet of vapour, an immense cloud envelopes the mountain, and, stretching out on all sides, like a

magnificent canopy, shades the town and the adjacent country from the sun. The inferior boundary of this cloud is regulated, probably, by various circumstances; and among others, by the strength of the wind, and the temperature of the air in the Table valley. The influence of the latter is to be inferred from the fact, that, though the cloud never descends farther than half-way into the hot parched amphitheatre of Cape Town, it may be observed on the side of Camp's Bay, rolling down in immense volumes to the very sea, over which it sometimes stretches farther than the eye can follow it. Nothing can be more singular than the appearance of this cloud. It is continually rushing down to a certain point on the side of the mountain, and there vanishing. Fleeces are seen from time to time, torn from its skirts by the strength of the wind, floating and whirling, as it were, in a vortex over the town, and then gradually dissolving away. But the main body remains as if it were nailed to the mountain, and bids defiance to the utmost efforts of the gale." There are two other mountains of nearly the same height, but of a different shape near the Table mountain.

The Dry mountains, which are near the Table mountain, are composed of horizontal strata of sandstone, and some of them have a flat summit. These mountains run in one dark chain many leagues in length, and they are so steep and uniform in shape, as to give the missionaries who have described them, the idea of the Great Wall of China.



PETER BOTTE'S MOUNTAIN.

Peter Botte's Mountain in the Mauritius is said to have obtained its very singular name from a person of the name of Peter Botte, who ascended to the summit but who was dashed to pieces when he attempted to come down. From the extraordinary shape of this mountain, it is evidently of volcanic origin, for it rises like a vast needle about 1,800 feet in height, and what makes the ascent more difficult is, that it does

not taper gradually to a point, but at a distance of about 1500 feet from the ground, there is a kind of platform, above which a piece of stone bulges out like a vast cupola. In 1831, Captain Lloyd, accompanied by a Mr. Dawkins, attempted to ascend this mountain, but when they had reached what is called the neck, they found the ladder they had brought with them was not long enough to reach half-way up the perpendicular face of the rock above, and they relinquished their attempt as impracticable. The following year, however, (the 7th of September, 1832,) Captain Lloyd made another attempt, accompanied by three other officers, and a number of sepoys and negroes. The ascent was up a very steep ravine formed by the rains in the wet season, and full of loose stones. Along this path, which was not a foot broad, the party picked their way for about four hundred yards, the negroes keeping their footing firm, by catching hold of the shrubs above them as they proceeded. "On rising to the shoulder of the mountain," says the narrative which has been published of the ascent, "a view burst upon us which quite defies my descriptive powers. We stood on a little narrow ledge or neck of land, about twenty yards in length, on the side which we mounted; we looked back into the deep wooded gorge we had passed up while on the opposite side of the neck, which was between six and seven feet broad, the precipice went sheer down fifteen hundred feet to the plain. One extremity of the neck was equally precipitous, and the other was bounded by what appeared to me the most magnificent sight I ever saw. A narrow knife-like edge of rock, broken here and there by precipitous faces, ran up in conical form to about 350 feet above us, and on the

very pinnacle old Peter Botte frowned in all his glory. A ladder had been left by Messrs Lloyd and Dawkins last year. It was about twelve feet high, and reached about half-way up the face of the perpendicular rock. The foot, which was spiked, rested upon a ledge which was barely three inches on each side. A grapnel line had also been left, but though it had never been used, it had become rotten by exposure to the weather. One of the negroes clambered from the top of the ladder along the cleft in the face of the rock, as he did not dare trust his weight to the line. It was a hazardous undertaking, as a single loose stone or false hold must have precipitated him into the abyss; but he used his feet exactly as a monkey would have done, grasping with them every projection as firmly as he could have done with his hands. He carried a small cord tied round his middle, and as soon as he reached the platform under the rock, he fastened it firmly, and crying, 'all right,' we all climbed up in succession. The head, which is an enormous mass of rock, about thirty-five feet in height, overhangs its base many feet on every side. A ledge of tolerably level rock runs round three sides of the base, about six feet in width, bounded everywhere by the abrupt edge of the precipice, except in the spot where it is joined by the ridge up which we climbed. In one spot, the head, though overhanging its base several feet, reaches only perpendicularly over the edge of the precipice, and most fortunately it was at the very spot where we mounted. When we reached the ledge, a communication being established with the shoulder of the mountain, by a double line of ropes, we hoisted up crowbars, additional coils of rope, and various other articles, but the difficulty was, how to get the ladder up against the

rock. Captain Lloyd had prepared some iron arrows, with thongs, to fire over, and having got up a gun, he made a line fast round his body, which we all held on, and going over the edge of the precipice on the opposite side, he leaned back against the line, and fired over the least projecting part. Had the line broken, he would have fallen at least 1800 feet. Twice this



failed, and then he had recourse to a large stone, with a lead line, which swung diagonally, and seemed to be a feasible plan. Several times he tried this without success, till at last, the wind changing, the stone went over and was eagerly seized on the opposite side. Three lengths of the ladder were now put together on the ledge, a large line attached to the one which was

over the head was carefully drawn up, and finally, a two inch rope, to the extremity of which we lashed the top of the ladder, then lowered it gently over the precipice, till it hung perpendicularly, and was steadied by two negroes, on the ridge below. 'All right, now hoist away,' and up went the ladder, till it came to the edge of our ledge, when it was lashed in firmly to the rock. We then hauled away on the guy to steady it, and made it fast; a line was passed over by the head line, to hold on, and up came Captain Lloyd, screeching and hallooing, and we all three scrambled after him. The union-jack and a boat-hook were passed up, and old England's flag waved freely and gallantly on the redoubted Peter Botte." The party afterwards descended to the platform, where they dined and passed the night; amusing themselves by letting off some rockets and blue lights which they had brought with them, and which must have had a most singular effect seen from such a situation. The night was so bitterly cold, that they found it almost impossible to sleep. The next morning, however, they ventured again to climb up to the summit, to take a last look at a view which they were not likely ever to see again, and afterwards descended in perfect safety from their perilous expedition.

SOUTH AMERICAN MOUNTAINS.

THE ANDES.

THESE are the highest mountains in America, and indeed, next to the Himalayas, in the world. The whole chain is more than 4,000 miles in length, ex-

tending throughout South America from north to south, generally at the distance of about 150 miles from the western coast, and reaching in many places an elevation of 20,000 feet above the level of the sea. The mountains of the chain differ considerably in character in different parts: in some places, they are blended together into one entire mass; and in others they are divided into two or three distinct ridges. In Chili, they are about 120 miles in breadth, presenting numerous pointed summits of prodigious height; in Peru, they divide into three irregular ridges; and in Quito they form two ridges, between which lies a kind of table land from 15 to 20 miles in breadth, at an elevation of 9,000 feet above the level of the sea. These ridges are called Cordilleras, from a Spanish word generally used to designate a mountain chain, and which is supposed to mean anything long, or drawn out. The word Andes signified originally the copper district; so that the expression Cordillera de los Andes is not tautology, but means literally, the mountain chain of the copper district. Generally, however, the western chain of the mountains is called the Cordillera, and the eastern chain the Andes.

Though the northern part of the Andes lies so near the equator, the summits of the peaks are all covered with snow; yet there are no glaciers or valleys covered with ice as in the European mountains. The mountains of the Andes are principally composed of porphyry, basalt, and green stone, which being often broken into columns, appear at a distance like ruined castles, and produce a very striking effect. The whole chain is subject to the most terrible earthquakes, and it contains no less than forty volcanoes, which are constantly

burning, and which discharge not only lava, but enormous quantities of water; and near Quito, liquid mud, often including myriads of small dead fish. In some parts the mountains, like the fabled cave of Æolus, seem at times to let out their imprisoned air, and produce such furious gusts of wind as to sweep every thing before them to a vast distance. In other districts, the efforts of the contending elements are betrayed, especially during the rainy season, by a doleful moaning noise, or hollow and portentous groans, which cannot be heard without inspiring secret awe and dread.

In Tschudi's *Travels in Peru*, lately ably translated by Miss Ross, there is a striking description of the difference between the Western chain or Cordillera, and the Eastern chain or Andes. "The Cordillera presents an aspect totally different from that of the Andes. It is more wild and rugged, its ridge is broader, and its summits less pyramidical. The summits of the Andes terminate in slender sharp points like needles. The Cordillera descends in terraces to the level heights, whilst the slope of the Andes is uniform and unbroken. The summits of the calcareous hills which stretch eastward from the great chain of the Cordillera are broken and rugged. Large cubical blocks of stone become detached from them, and roll down into the valleys. This disintegration, which is the effect of protracted rain and cold, imparts to the mountain ridges the most singular and beautiful forms; their fantastic outlines appearing like the work of human hands. Imagination may easily picture them to be monuments of the time of the Incas; for, viewed from a distance, they look like groups of giants or colossal animals. In former times the Indians viewed these

masses of rock with devout reverence, for they believed them to be the early inhabitants of the earth whom Pacchacamac in his anger transformed to stone."

A person climbing the Andes may go through, in the course of a few hours, every kind of climate in the known world. In the plains, under a burning sun, he will find pine apples and bananas growing wild in the fields; a little higher, groves of oranges and lemons will occur; and higher still, extensive fields of maize. Higher, the hills are covered with vines laden with grapes; and higher still, come the hardy fruits of Europe, followed by chestnuts, oaks, and beeches. Still higher, are pines and firs; and above them, stunted birches, and dwarf rhododendrons, heaths, and mosses, which extend to the border of perpetual snow, the boundary of which, so near the equator, is about 17,000 feet above the level of the sea.

One of the most remarkable peculiarities, however, which distinguish the Andes from the European mountains, is, their being subject to what are called quebradas, or perpendicular rents, which form very narrow vales of immense depth, whose terrific walls, fringed below with luxuriant trees and shrubs, seem to lift their naked and barren heads to the distant skies. The noted crevices of Chota and Cutaco are nearly a mile deep in vertical descent. The Icononzo, remarkable for its natural bridges, is a small quebrada or cleft of the mountains, through which flows the river of the Summa Paz, descending from the highest upland desert. The rocks here consist of two different kinds of sandstone, the one extremely compact, and the other of a slaty texture, divided into horizontal strata. The rent was probably caused by an earth-

quake, which the harder portion of the stony mass resisted; so that when the crumbling stone was swept away it remained and now forms a bridge, which connects the upper parts of the chasm. This very curious bridge consists of two parts, the upper of which is the bridge that was crossed by Bonpland and Humboldt, and which has a railing along it for the convenience of travellers. Below this is a second bridge, which is never used for any purposes of traffic. The upper arch is fifty feet long, forty feet broad, and eight feet thick at the middle. Its height is about 300 feet above the surface of the torrent, which has a medium depth of twenty feet. The lower bridge is about sixty feet below the other, and it curves so that the middle is the lowest part. It also differs from the other in being composed of three slanting blocks of stone wedged together, which probably fell from the rocks at the same instant of time, and struck against the sides of the crevice in their descent.

In the heights of the Cordillera, the effect of the diminished atmospheric pressure on the human frame shews itself in intolerable symptoms of weariness and extreme difficulty of breathing. This malady is called the *veta*, and the natives, ignorant of its real causes, ascribe it to the exhalations of metals, especially antimony, which is extensively used in the mining operations. "The first symptoms of the *veta*," Tschudi tells us, "are usually felt at the elevation of 12,600 feet above the sea. These symptoms are vertigo, dimness of sight and hearing, pains in the head, and nausea; and blood flows from the eyes, nose, and lips." Another scourge of the traveller in the Cordillera is the disease called the *surumpe*. "It is a violent inflammation of

the eyes," Tschudi tells us, "caused by the sudden reflection of the bright rays of the sun on the snow. By the rarefied air and the cutting wind, the eyes are kept in a state of constant irritation, and are rendered very susceptible to the effects of glaring light." In these regions the sky is often completely overshadowed by snow clouds, but as soon as the plain is covered by a sheet of snow, the sun's rays burst suddenly through the breaking clouds, and the eyes, unprepared for the dazzling glare, are almost blinded. A sharp burning pain is immediately felt; the eyes become violently inflamed, and the lids swell and bleed. The pain is, indeed, so intense that it frequently brings on delirium. The sensation resembles that which it may be imagined would be felt if Cayenne pepper were rubbed into the eyes. "In the Cordillera, Indians are often seen sitting by the road-side shrieking in agony, and unable to proceed on their way. They are more liable to the disease than the Creoles, who, when travelling in the mountains, protect their eyes by green spectacles and veils."

The highest peak of the Andes is called Chimborazo, and it was long supposed to be the loftiest mountain in the world, as it is more than 24,000 feet above the level of the sea. Humboldt attempted to ascend it, but when he had nearly gained the summit he desisted on finding that drops of blood issued from under his nails and from his eye-lids, in consequence of the rarity of the air. Though the summit of this mountain was so difficult of access, Humboldt informs us that a road 1,000 miles in length is found in its neighbourhood; and similar gigantic labours of the ancient Incas may be traced throughout the province.

Humboldt has described his passage across the mountain of Quindiu, which, he says, is one of the most difficult of access of any in the whole chain. "This mountain," he says, "is covered with a thick, uninhabited forest, which, even in the finest season, cannot be traversed in less than ten or twelve days. Not even a hut is to be seen, nor can any means of subsistence be found. Travellers, at all times of the year, furnish themselves with a month's provision, since it often happens that, by the melting of the snows, and the sudden swell of the torrents, they cannot descend on either side of the mountain."

The highest point of the road is 11,500 feet above the level of the sea. In some places the passage is along a slender ridge, or ledge of rocks, which it would be almost impossible for strangers to pass without falling, if the attendants did not hold a pole to serve as a sort of rail to the path. "The pathway, which forms the passage, is only twelve or fifteen inches in breadth, and has the appearance in several places of a gallery dug and left open to the sky. In this part of the Andes, as almost in every other, the rock is covered with a thick stratum of clay, in which the streamlets which flow down the mountains have hollowed out gullies about twenty feet deep. Along these crevices, which are full of mud, the traveller is forced to grope his passage, the darkness of which is increased by the thick vegetation that covers the opening above, so that the oxen, which are the beasts of burden commonly used in this country, can scarcely force their way through. Some of these galleries are more than a mile in length, and if perchance the traveller meets some loaded oxen in one of these passages, he finds no

means of avoiding them but by turning back, or climbing the earthen wall which borders the crevice, and keeping himself suspended by laying hold of the roots which have penetrated to this depth from the surface of the ground."

THE ORGAN MOUNTAINS OF BRAZIL.

The Organ Mountains of Brazil received that name from a fancied resemblance which the peaks, rising gradually one above another, bear to the pipes of an organ. "These peaks," Mr. Gardner informs us, "form part of a mountain range situated about sixty miles to the north of Rio, and which, branching out in various directions, stretches from Bahia to Santa Catharina, a distance of about 2,000 miles."

When Mr. Gardner began to ascend these mountains, he found for the first mile and a half a tolerably good path, leading through a forest of fine trees, with very little underwood, except some young palms, hundreds of which were cut down by the blacks who were clearing a road for the party. After leaving this forest the party came to another very thick forest composed almost entirely of bamboos, which it was very difficult to penetrate through. After this the party came upon an old track of a tapir, which is the largest South American quadruped, though it is not much bigger in the body than a calf about six months old, and it stands upon much shorter legs. The track was about two feet broad, and so well beaten, that the party following it advanced without any great difficulty, and were at leisure to admire all the beauties of the forest, which was quite alive with some of the most

beautiful specimens that can be imagined of both the animal and the vegetable kingdoms. Among the most curious specimens of the former, were numerous snakes and lizards of the most brilliant colours, and innumerable frogs, some of the small tree kind looking like beautiful green butterflies as they sprang from branch to branch. On the ground were innumerable other frogs, some of enormous size, and others uttering various discordant cries, among the most remarkable of which may be mentioned the blacksmith frog, whose every sound rings in the ears like the clang of a hammer upon an anvil.

There were also butterflies of all colours, now flying from flower to flower, and now alighting on the moist sandy banks of pools and small streams in countless numbers. Large nests of wasps hung from the boughs of the trees, and in open places the leaves and flowers of the bushes and other plants abounded with diamond and other beetles; while at night the air was lighted up with fire-flies of various sizes, which, from their brilliancy, almost gave the idea that a part of the stars had fallen from the firmament, and were floating about without a resting place.

The Organ Mountains are not very lofty, and, indeed, the highest point to which Mr. Gardner ascended, was not above 7,500 feet above the level of the sea; but he describes the view as being extremely beautiful. "The base of the mountains," he says, "was covered by a mass of snow-white clouds, spread out apparently about 3,000 feet below the point on which he stood, and shortly after sunrise this space appeared like a vast ocean covered with foam, through which the tops of the lower mountains rose like islands. In another

place the valley below looked like an extensive lake, surrounded on all sides by mountains; but as the sun gained power, the clouds gradually disappeared."

MOUNTAINS OF NORTH AMERICA.

THE ROCKY MOUNTAINS.

THE Rocky Mountains form the principal chain of mountains in North America. They are connected with the Andes by the Mexican Cordillera. The branch of the Andes which divides the seas at the isthmus of Panama is very low, being only 633 feet above the level of the Pacific Ocean; and the Mexican mountains lose the appearance of a chain and spread out into a table-land from five to nine thousand feet above the level of the sea, and from 100 to 300 miles in breadth; across this plain are several volcanoes, and beyond it begin the Rocky Mountains, the summits of which rise from 12,000 to 15,000 feet above the level of the sea. These mountains are about the same distance from the Pacific Ocean as the Alleghanies are from the Atlantic. Their general appearance is black, rugged, and precipitous; but though an expedition under Captains Lewis and Clarke crossed them, very little is known respecting their extent, and their numerous peaks are unnamed. It is supposed that there are some volcanoes amongst them, as pumice stones of a reddish colour, and remarkably perfect, frequently descend the Missouri. The great rivers which spring from the Rocky Mountains, such as the Arkansas on the east, and the Oregon or Columbia

on the west, wind through their declivities for more than 100 leagues before they escape to the plains. In following the beds of such streams, travellers pass through the range without any considerable ascent or obstruction. Following the Platte, which is one of the principal southern branches of the Missouri, the traveller finds a road even to lake Buenaventura, on the Pacific plains, that needs little labour to adapt it to the passage of horses and waggons. The southern part of this range is called the Masserne Mountain; and a single peak of these mountains, called Mount Pike, is seen as a land-mark for an immense distance over the plains of Arkansas and Texas. Some very beautiful plants, now common in our gardens, such as the *Clarkia*, the *Ribes sanguineum*, &c., were brought from the Rocky Mountains and their neighbourhood.

THE ALLEGHANIES.

THE Alleghany Mountains are composed of three, four, and in some places of five parallel chains, extending in a north-east direction from Alabama to New Brunswick, over a space 1,100 miles in length, with a breadth varying from 100 to 150 miles, and a height of from 2,000 to 3,000 feet. "They are almost everywhere clothed with forests, and interspersed with delightful valleys. Between the Alleghanies and the great western chain, the Ozark Mountains, from 1,000 to 2,000 feet in height, and 500 miles in length, extend along the middle of the great valley of the Mississippi in a south and north direction. The Arkansas and Red River are the only streams that have cut a passage

through these mountains, which, though low, occupy a great breadth, and are covered with wood." The Magnolias, Rhododendrons, Azaleas, and other similar plants, all come from the Alleghany mountains and the adjoining valleys.

EUROPEAN MOUNTAINS.

THE ALPS.

THE ancients called all mountains that had sharp peaks covered with snow, alps; but in modern times, the name is applied only to a chain of European mountains extending from the Mediterranean to the Black Sea. These mountains form a vast barrier, dividing Italy from the rest of Europe, and they are closely united with the Apennines on the west, and with the Balkhan on the east, the latter forming a mountain chain which extends through a great part of Turkey and Greece. From its being necessary to traverse the Alps to enter Italy by land, this chain is familiar to most European travellers, and the names of its principal mountains are well known. Of these mount Cenis and the Simplon are celebrated for the roads which have been made over them; the Great St. Bernard is remarkable for its well known convent; St. Gothard is the centre of the chain; and Mont Blanc is the loftiest mountain in Europe, though it is very inferior in height to the mountains of Asia or America, as its highest peak is not quite 16,000 feet above the level of the sea. Mount Rosa, Mount Jura, and the Jungfrau are also celebrated mountains of the Alps.

The scenery of the Alps is principally distinguished by the numerous lakes which adorn the valleys, and by the glaciers or fields of ice which are found in great abundance in various parts, and which are unknown in either the Andes or the Himalayas. These extraordinary phenomena lie just below the boundary of eternal snow, and are thus described by an able writer on the subject:—The lower edge of the snow line differs much from that above it, and might more properly be called the *ice line*, because the snow, owing to the influence of rain, the heat of the sun, and the heat of the earth, is there partially melted every summer, and frozen again every winter, forming an icy boundary. This boundary is, in fact, what is called a glacier. Above this zone, the region of the glaciers, the snow is seldom moistened by rain or softened by the rays of the sun. The glaciers are not stationary, but occasionally move downwards, with a motion more or less rapid. These movements of the glaciers sometimes take place unexpectedly, as was experienced some years ago by a priest of the Grindelwald, who, along with a chamois hunter, was travelling in the Alps, when they felt the glacier on which they were, moving under them. The travellers were resting themselves, and had lighted their pipes, when suddenly a frightful noise resembling thunder was heard. Everything around them immediately began to move: their fowling-pieces, which they had laid on the ice, slid away from them, and masses of rock, which a few moments before lay quietly on the surface of the glacier, bounded about in all directions. At a short distance, some fissures closed with a loud noise like that of cannon, and forced the water contained in them several fathoms upwards. New rents,

from ten to twelve feet deep, burst open with indescribably fearful noises, and the mass of ice, on which the travellers were reclining, detached itself and moved gradually downwards for several yards. The terror of the unfortunate priest may be imagined, as he thought some dreadful convulsion of nature was approaching; but the chamois hunter, who was more accustomed to the dangers of the ice, predicted that the movement would not be of long duration; and, in fact, in a few seconds all was still again, the glacier became fixed, and the dead silence was interrupted only by the call of the marmot.

The total number of glaciers in the whole range of the Alps may be between 500 and 600, but the most remarkable are those of the Grindelwald, the lower one of which is very beautiful; and the immense mass formed by the glaciers which descend from the western base of Mont Blanc, south east of Geneva, and to which the name of Mer de Glace or Sea of Ice is applied. The surface of the ice in this glacier is extremely rough and uneven; and its colour is a deep blue, which in many places passes into green, and only becomes white when it approaches the snow line. The ice forms first in crystals, which partially thaw, and then freeze again; so that in a short time the crystals become changed into a number of ridges and grooves of solid ice, which look at a little distance like the waves of the sea; and, indeed, a fanciful imagination might easily suppose that the waves of the sea had been suddenly frozen, and left in the state in which they now appear. At the lower extremity of each glacier is generally a large cavern or vault, sustained by massive columns of ice. "These grottos are sometimes a hundred feet high, and from fifty to eighty feet

wide, but their dimensions and shapes vary greatly. Their sides, acted on by the thawing, are smooth, so that on them the reticular texture of the glacier-ice can be seen with the greatest distinctness. Through these apertures all the water is discharged which is collected by the melting of the lower surface of the glacier. In winter the stream issuing from them is but small, but in summer it gushes out in a plenteous torrent." In many parts the glaciers are traversed by a smaller or greater number of chasms, as though the whole mass had been fractured in different places. "This is easily to be accounted for, as in these parts the bottom of the valley in which the glacier lies, usually forms a rapid slope, and is at the same time uneven and rugged. Where the icy masses descend a steep declivity, or are propelled over very broken ground, their surfaces present nothing but a continual succession of irregular and frequently deep chasms, and cliffs of ice rising from twenty to a hundred feet high. Where the slope of the valley exceeds thirty or forty degrees, the beds of ice break into fragments, which get displaced, upheaved, and piled together in every fantastic variety of form. Masses of ice, resembling steeples or towers, and others having the form of walls, rise with sharp points or edges to a hundred feet, representing an immense ruin converted into ice. But these icy masses are subject to continual changes." "Every moment in summer," says a modern traveller "these steeples, walls, or columns break down partly or entirely; and when the icy masses are standing on the edge of a perpendicular or precipitous rock, they tumble down with a loud but peculiar noise, and in falling are broken up into many thousand pieces, which,

when viewed from afar, resemble the cataract of a torrent. This is one of the most extraordinary and grandest views the traveller can enjoy in the Alps."

The chasms in the glaciers are of various kinds, some opening in the day, and some in the night. The former are by far the least dangerous; and the following very graphic account of the formation of one, has been handed down to us by an eye-witness. "When I was once walking," says Hugi, "on the glacier of the Lower Aar, at three o'clock in the afternoon, and the weather being very hot, I heard a peculiar noise: advancing directly towards the spot whence it proceeded, I had hardly walked thirty or forty paces before I felt that the whole icy mass trembled under my feet. The trembling soon ceased, and then began again, continuing by starts. I quickly discovered the cause. The ice was splitting and forming a chasm. Before my eyes it split suddenly over a space of twenty or thirty feet in length; so rapidly that I could not keep up with it. Then it appeared to cease, or rather the rent proceeded more slowly, until the trembling returned, and the splitting proceeded at an accelerated rate. Several times I advanced to the end of the new formed rent, and laid myself down on the ice, to look into the gulf that was being formed." He proceeds to say that the chasm continued to open till it was about an inch and a half wide, and four or five feet deep. Some days afterwards, he again visited the place, when he found that the opening had increased to the breadth of about six inches; and that another rent had formed parallel with the first, but at about twelve feet distant. These rents, it seems, only open during hot weather, and when rain is going to fall; but they some times increase so rapidly, as quite to change the ap-

pearance of the glacier, and to render places impassable, that only a few weeks before were perfectly safe.

The chasms that open in the night are even more dangerous than those of the day: their form is the reverse, Mr. Forbes informs us, of the day chasms. "They have the wider opening directed towards the base of the glacier, and terminating at its upper face, under the layer of snow which there covers the icy mass. This layer of snow falls sometimes into the chasm, but more frequently it is carried away by strong gusts of wind, which come up from the interior, and bring up an exceedingly cold air. The interior of the chasm then becomes visible, and it is found that these spacious caverns of wide dimensions are filled with piles of detached ice-blocks, tossed in chaotic heaps, whilst watery stalactitic icicles, of ten or twenty feet in length, hang from the roof, and give to these singular vaults all the grotesque varieties of outline which are so much admired in calcareous caverns, but which here shew to a far greater advantage, in consequence of their exquisite transparency and lustre, and from being illuminated, not by a few candles, but by the magical light of a tender green, which issues from the walls of the crystal chambers."

Almost all the travellers, who have been in the Alps, and have visited their glaciers, speak with rapture of their colours. "When, however, single crystals, or even small portions of the mass, are broken off, and viewed separately, they shew nothing of this colour. They are commonly white and transparent like ice, or frothy and semi-opaque. The colour appears only in the entire mass. The blue colour begins to appear gradually, and passes through all the shades from the slightest tinge to the darkest hue of

the *lapis lazuli*. In some glaciers the blue has a mixture of green, which doubtless is to be ascribed to the prevalence of the frothy semi-opaque layers. In the lower parts of the chasms and clefts, where the ice of the glacier is in a state of dissolution by thawing, the blue colour is of a purity and beauty which can be admired, but neither described nor imitated. Where the glacier approaches the snow-mountain, the colour gets fainter, and at last passes into that of the ice of the snow-mountain, which, as above observed, is white, with a tinge of blue which is hardly perceptible."

Notwithstanding the extreme beauty of the snowy mountains and their glaciers, it is by no means desirable to live in their vicinity; as it is generally supposed that persons who drink no other water than that which flows from the melted ice and snow of the glaciers, are subject to a peculiar swelling of the glands of the throat, which is called a *goître*. Modern writers deny this assertion: but it is certain the valleys are inhabited by a miserable race of beings called Cretins, who are afflicted, not only with the *goître* in the throat, but with rickets which cripple and deform their bodies, and mental imbecility. It is true that in some cases, the *goître* is not attended with the other symptoms of cretinism; and on the other hand, that the Cretins are often found without enlarged throats; but very generally the unhappy victims are afflicted in both manners, and the cause is now supposed to be the want of pure air. The valleys of the Alps are surrounded by very high mountains, sheltered from currents of fresh air, and exposed to the direct, and, what is worse, the reflected rays of the sun. The ground is also generally marshy, and hence the atmosphere is humid, close, and oppressive.

Avalanches are very common in the Alps. These are masses of snow or ice, which fall from the upper parts of the mountains into the valleys, and often occasion a great destruction of life and property. There are four kinds of these phenomena; viz. drift avalanches, sliding avalanches, creeping avalanches, and ice avalanches. *The drift avalanches* are composed of loose snow, and they only take place when a very heavy fall of snow has occurred in the higher regions during a calm. Great masses are then lodged on declivities, which are sufficient to afford a support to them during calm weather, but not when the atmosphere is agitated by strong gusts of wind. Winds of this kind detach the uppermost mass, and bring it down upon other masses, which lie lower, and which in their turn are forced off, and thus an enormous volume of snow is collected before the avalanche reaches the valley, where it always descends unexpectedly, and without any apparent cause, the gust of wind not being perceived in the deep valley. The incredible velocity with which the drift avalanches descend, and the immense force with which they strike, prove that they must have originated at a great elevation. They are very much dreaded, not so much on account of the damage caused by the snow itself, as from the effects of the compression of the air, with which they are always attended. The air compressed by these masses rushes off on all sides with the greatest velocity, and with a force able to break off huge pieces of rock, to uproot the largest trees, and to scatter houses like chaff. It is very fortunate that the drift avalanches are not of frequent occurrence, and that they rarely descend to those valleys which are thickly peopled and well wooded.

The sliding avalanches, though less destructive in their effects than the drift avalanches, cause greater damage than the others, on account of their frequency. They take place when the snowy covering of the declivities, by having been slightly thawed and again frozen, has acquired a considerable degree of consistency on its surface, and has been cemented to some extent into one mass. When, under such circumstances, by the natural heat of the earth, the bond has been loosened which unites the mass to its base, and the ground on which it rests has been rendered slippery, the whole mass begins to slide downwards in one sheet, and precipitates itself over every obstacle into the valleys. These avalanches originate in the middle regions of the mountains, on declivities which have not a very rapid slope, and in spring time. They are less dangerous because they are not attended by a compression of the air, but they cause great damage by the enormous masses of snow which they bring down. These masses are sometimes so great as to cover large extents of meadow and forest with such a thick layer of snow, that several summers must pass before it is entirely melted; and this affects the climate of the valley in a very disadvantageous way. They also frequently cause considerable loss of life and property. "In the year 1749 the whole village of Bueras, in the valley of Tawich, in the canton of the Grisons, was buried under, and at the same time removed from its site by, an avalanche of this description. But this change, which happened in the night-time, was effected without the least noise, so that the inhabitants were not aware of it, and on awakening in the morning could not conceive why it did not grow day. One hundred persons were dug out of the snow, sixty of

whom were still alive, the hollows within the snow containing sufficient air to support life. In 1806 an avalanche descended into Val Calanca, likewise in the canton of the Grisons, transported a forest from one side of the valley to the other, and planted a fir-tree on the roof of the parsonage-house. Several villages have been destroyed by these avalanches, and a large number of persons and cattle have been killed. But in general they do not come on unexpectedly. The places where they frequently occur are known, as also what kind of weather commonly precedes their descent." *The creeping avalanches* originate in the same way as the sliding avalanches, but on declivities which have a much more gentle slope. They are very frequent, but rarely cause much damage. *The ice avalanches* are fragments of glaciers which have become accidentally detached, and which are frequently broken into small pieces by other masses of ice, or the rocks they meet with in their progress. When seen in this state from a distance, they resemble the cataracts of a powerful stream. "In summer, which appears to be the only season in which they occur, they may every day be seen on almost all the glaciers of Switzerland; and at the base of the Jungfrau, in the valley of Lauterbrun, in the canton of Berne, the thunder which accompanies their fall is almost continually heard. They are not in general destructive, because they descend upon places which are not inhabited. Yet occasionally their fall is attended with terrible effects. This is especially the case when a glacier terminates on the very edge of a high mountain-mass, which descends with a perpendicular declivity into an inhabited valley. A very dreadful catastrophe of this kind occurred in 1819 in

the valley of Visp in Valais, where the village of Randa was destroyed by a glacier avalanche. This village was built not far from the base of a mountain-mass, which rises nearly perpendicularly to an elevation of more than 9000 feet above its base, and forms part of the snow mountain called Weisshorn (white horn), which is everywhere surrounded with huge masses of glaciers. One of these glaciers had advanced to the very edge of the precipice, and was overhanging it, when at once an enormous piece of it was detached, and with a terrible crash precipitated down into the valley, where it covered with ice, rubbish, and fragments of rock, an area of 2400 feet in length, and 1000 feet wide, to a depth of more than 150 feet." The mass fell on an uninhabited tract of country adjoining the village of Randa, but the village itself was destroyed by the compression of air produced by the fall of such an enormous mass. The force of the wind was so great that millstones were raised and carried up an ascent of several yards; the beams of several houses were conveyed nearly a mile into the forest, and the steeple of the church, which was of massive stone, was snapped asunder.

Mountain slips are of almost daily occurrence in some parts of Switzerland. Sometimes they consist only of small fragments of rocks, which roll down the sides of a steep acclivity, and hurt those who are laboriously toiling up from below; but it sometimes happens that huge masses of rock, crowning the summit of very elevated peaks, descend into the contiguous lowlands, which are many thousand feet lower, and, of course, mountain slips of this kind are always attended by the most disastrous effects. Rather more than 200 years

ago, a well built and pleasant town existed in Val Bregaglia, just at the foot of Mount Conto, the walls of the town being washed by the river Mera. On the 25th of August, 1618, the rainy season set in, and heavy rain continued to fall every day for nearly a week. It was observed that some large chasms in the side of the mountain increased during this heavy rain; but as the chasms had existed more than ten years, nobody paid much attention to them. On the 4th of September the weather was serene and pleasant, but in the afternoon some rubbish, composed of rocky fragments, came rolling down Mount Conto; and in the night, whilst the air was quite calm, and the sky cloudless, the summit of the mountain rushed down with a tremendous crash, and covered the whole town, burying 2430 of the inhabitants in its ruins. Only one house was left standing, and a forest of chestnut trees now grows on the remains of the mountain.

Where the cantons of Valais and the Pays de Vaud unite there is a piece of table land, "which is so elevated, that its surface is partly covered with snow and partly with glaciers." Out of this great snow-field rise the curious large pointed peaks called the Diablerets. There are now only three of these peaks; but early in 1714 there were four of them. Towards the close of that year a fearful groaning was heard under the ground, the earth trembled, and when the peak fell, a thick smoke rose to a considerable height in the air. It was only dust, which was detached from the rocks when they broke to pieces. The compression of the air was so great, that some of the trees, which were near the places on which the rocks descended, were bent to the ground, or broken. Fourteen of the

herdsmen were found dead, with many sheep and cattle; and others were supposed to be killed, as they were missing. One man among the last was supposed to have lost his life; and his children were declared orphans by the court; but three months afterwards, on Christmas Eve, he suddenly reappeared in his native place, pale, thin, and covered with rags, resembling a spectre. All the inhabitants of the village were frightened. The doors of his own house were shut against him; and some people ran to the priest, requesting him to exorcise the supposed ghost. After some delay, the man succeeded in convincing the people that he was alive, and then he told them that in the moment on which the mountain-slip took place, he had been on his knees, praying to the Preserver of life, when an enormous fragment of rock, in descending, struck the ground before his dwelling, and resting, leant over against the rocky wall at the base of which his hut was built. It was immediately followed by a terrible crash, and by an immense quantity of stones and rubbish, entirely covering the piece of rock which protected his hut. When all became quiet, he continued, "I was no longer in fear; I did not lose my courage, and directly I set myself to work to form an opening. A few pieces of cheese, which I had in the cottage, were my food, and a rill of water, which descended among the ruins, quenched my thirst. After many days, which I was unable to count in the long darkness of my subterraneous prison, I discovered, by creeping about among the rocks, an opening; and I saw again the sun's light, but my eyes were for some time unable to bear it. The Almighty, in whom I confided, and who always kept alive my hope of preserving life, has

sent me back to my family to be a witness and a proof of his power and bounty."

A second slip of the Diablerets took place in 1749, and though none of the inhabitants of the country lost their lives, it proved fatal to five citizens of Berne, who were in the neighbourhood on business; and who, though warned to fly when the subterranean noise was first heard, disregarded the admonition, and were buried alive; the house in which they were, being supposed to be buried 500 feet below the present surface.

The most remarkable mountain-slip in Switzerland, was, however, that which took place in 1806, by which the Vale of Goldau, above three miles in extent, and five villages with their inhabitants were engulfed. The Vale lay between two mountains, one of which was called Mount Ruffi, or the Rosenberg, and the other Mount Righi. More than fifty years before the catastrophe, rents had been gradually forming in the Rosenberg; and in 1806, a very great quantity of rain fell in the months of July and August. On the morning of the second of September, most extraordinary noises were heard proceeding from the interior of the mountain, which gave an idea of the groaning of an imprisoned giant. About five o'clock in the afternoon, some masses of rock came rolling down the side of the mountain; these were followed by some larger pieces, which fell with a loud crash, and immediately afterwards, some persons who were in a house on the side of Mount Righi, about 300 feet above the valley, saw a large horizontal rent appear in the opposite mountain, and the whole summit, above the rent, began to move, with all its forests and houses, and slowly to descend. In a few seconds, the velocity increased, and

then the enormous mass rushed down with frightful rapidity and fell with a tremendous crash. Immense clouds of dust, which obscured every thing, rose from the ruins; and in the midst of a thick darkness, a torrent of stones, as if thrown by invisible hands from below, assailed the house in which the observers stood, and amongst these were many large fragments, several hundred pounds in weight. Thus, "in five minutes—for the whole catastrophe did not take up more time—the beautiful and well cultivated Vale of Goldau, with its fields, orchards, and pastures, was converted into a waste," and the greater part of the Lake of Lowerz was filled up. Four hundred and eighty-four persons lost their lives, and a great number of sheep and cattle were killed. The loss of property, at the lowest estimate, exceeded £90,000; but the desolation which was produced exceeds all calculation. A small chapel has been built on the spot where the Vale of Goldau once stood; and in this chapel the pious Swiss annually meet on the second of September to pray to God to preserve them from a repetition of such a frightful calamity.

ASCENT OF MOUNT BLANC.

THE summit of Mount Blanc is a ridge, nearly horizontal, lying east and west. The slope at each extremity is inclined from twenty-eight to thirty degrees: the slope on the south side being much less than that on the north. The ridge is so narrow, as scarcely to allow two people to walk abreast, especially at the west end, where it resembles the roof of a house. It is wholly covered with snow, nor are any bare rocks to be seen



THE GRAND AND PETIT MOULETS.

within 150 yards of the top. The surface of the snow is scaly, and, in some places, covered with an icy crust, under which the snow itself is dusty, and without consistence. There are five glaciers, which extend almost to the plain of the Vale of Chamouni, and are separated by wild forests, corn fields, and rich meadows, so that immense tracts of ice are blended with the highest cultivation, and perpetually succeed to each other, in the most singular and striking vicissitude. All these several valleys of ice, which lie chiefly in the hollows of the mountains, and are some leagues in length, unite together at the foot of Mount Blanc. One of the peculiarities of this mountain is, that besides the

principal summit, there are numerous steep rocks which rise from it, and which, from their resemblance to pyramids or steeples, are called needles; some of which are quite bare, as they are too steep for any snow to rest upon them, as, for example, those called the Grand and Petit Mulets. These bare black rocks have a most striking effect contrasted with the immense masses of snow which surround them, and which spread over an extent of country of about 600 square miles, or twice the area of the county of Middlesex, only intersected by a few narrow valleys which are so depressed as not to catch the eye.

The summit of this mountain was deemed inaccessible before Dr. Paccad, a physician of Chamouni, reached it, in August, 1786. Soon after, it was again successfully attempted by M. de Saussure, and it has been several times accomplished since. The following is an abridgement of one of the accounts which have been published of the ascent of this mountain.

“Although it is scarcely six miles and three-quarters in a straight line from the priory of Chamouni to the top of Mount Blanc, it requires, nevertheless, eighteen hours to gain the summit, owing to the bad roads, the windings, and the great perpendicular height of the mountain. To the priory the journey was free from danger, or even difficulty; the road being either rocky or covered with grass; but thence, upwards, it was wholly covered with snow, or consisted of the most slippery ice. The ice-valley on the side of the hill must be passed, in order to gain the foot of the chain of rocks bordering on the perpetual snows which cover Mount Blanc. The passage through this valley is extremely dangerous, since it is intersected with numerous wide,

deep, and irregular chasms, which can only be crossed by means of bridges, naturally formed of frozen snow, or of fallen trees, and these, often very slender, extended, as it were, over an abyss, are liable to break. The difficulties the party had to encounter in this valley, and the winding road they were obliged to take through it, occasioned them to be more than three hours in crossing it, although in a straight line, its breadth is not above three-quarters of a mile.

“After having reached the rocks, they mounted in a serpentine direction to a valley filled with snow, which runs from north to south, to the foot of the highest pinnacle. The surface of the snow in this valley has numerous fissures, and when it is broken perpendicularly, it affords an opportunity of observing the successive horizontal layers of snow, which are annually formed.

“The party passed the night at a height of 3,100 yards above the priory of Chamouni, and 4,250 yards above the level of the sea, which is 200 yards higher than the Peak of Teneriffe. They dug a deep hole in the snow, sufficiently wide to contain the whole company, and covered its top with the tent cloth. In making this encampment, they began to experience the effects of the rarity of the atmosphere. Robust men, to whom seven or eight hours’ walking, or rather climbing, were an absolute nothing, had scarcely raised five or six shovels full of snow before they were under the necessity of resting and relieving each other almost incessantly. One of them had gone back a short distance to fill a cask with some water, which he had seen in one of the crevices of the snow, but found himself so disordered in his way, that he returned with-

out the water, and passed the night in great pain. The principal inconvenience which the rarity of the air produces, is an excessive thirst. The travellers had no means of procuring water but by melting the snow, and the little store which they had carried with them afforded but a feeble supply for twenty men."

This region of the mountain presents to the view nothing but snow of the purest and most dazzling whiteness, forming a very singular contrast with the sky, which appears remarkably black. "No living creature," says our author, "is to be seen in these desolate regions, nor is the least trace of vegetation to be discovered. It is the habitation of cold and silence. I was frequently obliged, in the course of the night, to go out of my tent to relieve my breathing. The moon shone with the brightest splendour, in the midst of a sky, black as ebony. Jupiter, rayed like the sun, arose from behind the mountains of the east. The light of these luminaries was reflected from the white plain, or rather basin, in which we were situated, and, dazzling, eclipsed every star, except those of the first and second magnitude. At length we composed ourselves to sleep. We were, however, soon awakened by the noise of an immense mass of snow, an avalanche, which had fallen down from the top of the mountain, and covered part of the slope over which we were to climb the next day.

"We began our ascent to the third and last plain, and then turned on our left in our way to the highest rock, which is on the east part of the summit. The ascent is here very steep, being about thirty-nine degrees inclined to the horizon, and bounded on each side by precipices. The surface of the snow was so



SUMMIT OF MOUNT BLANC.

hard and slippery, that our pioneers were obliged to hew out their footsteps with hatchets. Thus we were two hours in climbing a hill only about 530 yards high. Having arrived at this last rock, we turned to the westward, and climbed the last ascent, whose height is about 300 yards, and its inclination above twenty-eight or twenty-nine degrees. On this peak the atmosphere is so rare that a man's strength is exhausted with the least fatigue. When we came near the top, I could not walk fifteen or

sixteen steps without stopping to take breath, and I frequently perceived myself so faint that I was under the necessity of sitting down from time to time, but in proportion as I recovered my breath, I felt my strength renewed. We arrived at the summit of Mount Blanc at eleven o'clock in the forenoon, and I now enjoyed the grand spectacle that was under my eyes. I could scarcely believe my eyes—I thought myself in a dream—when I saw below my feet so many majestic peaks, especially the Needles, the Midi Argentière, and Gêant, whose bases had proved so difficult and dangerous of access. I obtained a perfect knowledge of their proportion to, and connexion with, each other; of their form and structure; and a single view removed more doubts and afforded more information than whole years of study. While I was thus employed, my guides pitched my tent, and were fixing my apparatus for the experiments I had proposed to make on boiling water, but when I came to dispose my instruments for the purpose, I was obliged almost at every instant to desist from my labours, and turn all my thoughts to the means of respiration. While I remained perfectly still, I experienced but little uneasiness more than a slight oppression about my heart; but on the smallest bodily exertion, or when I fixed my attention on any subject for some minutes together, and particularly when I pressed my chest in the act of stooping, I was obliged to rest, and pause for two or three minutes. My guides were in a similar condition. We had no appetite, and our provisions, which were all frozen, were not well calculated to excite it. Nor had we any inclination for wine or brandy, which increased our indisposition,

most probably by accelerating the circulation of the blood. Nothing but fresh water relieved us, and much time and trouble were necessary to procure this article, as we could have no other than melted snow. I remained on the summit till half-past three, and though I did not lose a single moment, I was not able to make all those experiments in four hours and a half, which I have frequently done in less than three hours by the sea-side. We returned much easier than I could have expected, since in descending we did not experience any bad effects from the compression of the thorax, our respiration was not impeded, and we were not under the necessity of resting, in order to recover our breath and strength. The road down to the first plain was, nevertheless, by no means agreeable, on account of the great declivity; and the sun shining brightly on the tops of the precipices below us, made so dazzling an appearance, that it required a good head to avoid growing giddy from the prospect. We pitched our tent again on the snow, though we were more than 400 yards below our last night's encampment; and I was here fully convinced that it was the rarity of the air, and not the fatigue of the journey, which had incommoded us on the summit of the mountain, as we found ourselves, when so much lower, quite well, and able to attack our supper with a good appetite."

HOSPITAL OF THE GREAT ST. BERNARD.

THE mountain called the Great St. Bernard is remarkable for its monastery, called the Hospice of the Great

St. Bernard, which is near one of the most dangerous passes of the Alps. "In these regions," says a writer on the subject, "the traveller is often overtaken by the most severe weather, even after days of cloudless beauty, when the glaciers glitter in the sunshine, and the pink flowers of the dwarf Rhododendron appear as if they were never to be sullied by the tempest. But a storm suddenly comes on, the roads are rendered impassable by drifts of snow, and the avalanches sweep the valleys, carrying trees and crags of rock before them. In these storms the hospitable monks, though their revenue is scanty, open their door to every stranger that presents himself. But their attention to the distressed does not end here. They devote themselves to the dangerous task of searching for those unhappy persons who may have been overtaken by the avalanches or the sudden storms, and would perish but for their charitable succour. Most remarkably are they assisted in these truly Christian offices. They have a breed of noble dogs in their establishment, whose extraordinary sagacity often enables them to rescue the traveller from destruction by searching for, and discovering them, even when they have been buried in the snow."

ROADS OVER MOUNT CENIS AND THE SIMPLON.

As it is necessary to pass over the Alps to travel by land from France into Savoy and Italy, it is of great importance to render the journey as easy as possible. Before the time of Napoleon, travellers were generally carried over the mountains in chairs, or on mules; but

in 1805 Napoleon ordered a winding road for carriages to be constructed over Mount Cenis, which is thirty miles long, and eighteen feet wide. The road over the Simplon, from Valais to Piedmont, is thirty-six miles long, and twenty-five feet wide throughout; and it is nowhere too steep to be passed by the heaviest waggons. "It is carried over steep precipices, and through six galleries hewn in the rocks. Some of these passages are several hundred paces in length, and are lighted by openings. From them you step into lovely valleys, adorned with cottages, and see above them dark forests of pine; glaciers, and peaks covered with snow shining in the blue sky. Bridges are thrown over tremendous precipices, from one mountain to the other. The Italian side offers a more beautiful spectacle than the Swiss, because the rocks are steeper. The *grande galerie* is 683 feet long, entirely excavated in granite, called the *gallery of Frissinone*, from the rivulet, which forms a splendid cascade near it. The road commences a mile westward from the Brieg, and leads over the Saltina bridge. It then goes through a beautiful grove of larch trees to the first gallery, and then over another bridge, eighty paces in length, to Persal. Here begin precipices and avalanches, on account of which the road has many windings. At the *galerie des glaciers* the growth of trees ceases, and the road rises to an immense height above the Lago Maggiore, or almost 6000 feet above the level of the sea. At this point stands a *hospitium* for travellers; and four miles farther on lies the village of Simplon. Shortly after this the territory of Valais terminates near the chapel, the first Italian village being St. Marco." There are other roads across the Alps, but these are the most important;

and as roads are the work of man, even these would not have been mentioned in the present work, which is only intended to include the wonders of nature, had not the natural peculiarities of the country been so decidedly taken advantage of in forming them.

THE PYRENEES.

THE Pyrenees form a chain of mountains which divide Spain from France, almost in a straight line; and extend from the shores of the Mediterranean to St. Sebastian in the Bay of Biscay. The length of the Pyrenees from east to west is about 250 miles; and their breadth, though it varies considerably, may be averaged at sixty miles. The appearance presented by the Pyrenees is extremely imposing. When viewed from the neighbourhood of Toulouse, which is near the centre of the range, they seem to form one single mountain, increasing in height towards the east, but broken into summits of various forms and characters. The aspect of the mountains changes, however, considerably in different states of the atmosphere; and during the prevalence of west and north-west winds they are shrouded in mist. "From the principal chain proceed various inferior ridges. The acclivity of the Pyrenees on the side of Spain, is often extremely steep, presenting a succession of rugged chasms, abrupt precipices, and huge masses of naked rock; on the side of France the ascent is more gradual." Among the celebrated mountains in this range may be mentioned Montserrat, celebrated for its monastery and curious hermitages. Mont Perdu is, however, generally considered the

highest mountain of the range, and its summit is estimated by some writers to be more than 11,000 feet above the level of the sea. The Pyrenees contain a great number of valleys, which present a succession of basins or small lakes. These lakes "are formed by the mountains which border the valley receding from the banks of the river, and leaving a circular hollow, where there is so slight an acclivity that the stream undulates slowly, until at the extremity of the basin, where it resumes its original character, and runs through the gorges of the mountains, and dashes over their precipices. These basins are in general considerably elevated above each other, and are joined together by narrow and deep ravines, rapidly inclined plains, or by a slope of rock, so very perpendicular, that the river dashing over forms a cataract from the basin above to that beneath." Thunder storms are very frequent in these mountains, and have a remarkably grand effect. The Pyrenees also abound in mineral springs, some of which are said to have effected wonderful cures. There are upwards of 100 passages for pedestrians, and seven for carriages over these mountains, between France and Spain. The valley of Campan is considered the most beautiful part of the Pyrenees; but it is chiefly inhabited by an unfortunate race of men called Cagots, resembling the Cretins of the Alps. These people are thin and pale in appearance, and generally mutilated or lamed in some manner from the accidents to which they are continually subject among the rocks. In former ages they were shut out from society as lepers, and abhorred as heretics and cannibals! Their feet were bored with an iron, and they were forced to wear an egg-shell on their clothes by way of distinction. The name of Cagot is derived by

some authors from *canis guttus*, dog's-dish, in proof of the detestation in which they are held. "Opinions are much divided with regard to the origin of this miserable race, living in the midst of a highly cultivated people. The most plausible conjecture is that which derives them from some northern barbarians, who migrated into the south of Europe in the third or fourth century."

GERMAN MOUNTAINS.

THE southern part of Germany is either covered with, or penetrated by, steep mountains, one part of which extends from the Alps, and the other from the Carpathian range. These mountains gradually diminish in size as they advance northward; and from the last of them, the Hartz, which is on the confines of Hanover, begins a vast plain which extends over the north of Germany, through Prussia and Poland, and over a considerable part of Russia. The loftiest mountains of Germany are those which spring from the great mass of the Alps; but the highest of them (the Ortel) is less than 15,000 feet in height.

The Hartz forms a separate mountainous chain, seventy miles in length, and from twenty to thirty miles in breadth. This mountain range spreads through an extent of country containing forty towns, and numerous villages, with 56,000 inhabitants, belonging principally to Hanover. The Hartz is divided into the upper and lower; the Brocken, the loftiest mountain of the chain, forming the line of separation; the upper Hartz lying to the west, and the lower to the east of the Brocken. The same summit is also the dividing

point of the rivers, those on the east emptying themselves into the Elbe, and those on the west into the Weser. The Brocken is not quite 3,500 feet high, and it is covered with wood up to the summit, though, from the rock being entirely of granite, and the surface soil very thin, the firs dwindle into dwarf trees which bear the marks of decrepit old age. Both the upper and lower Hartz abound in mines; but the most curious part of the whole range of mountains, is a wide plain on the summit of the Brocken, which the country people believe to be "the place of the annual rendezvous of all the witches and spirits of Germany, and of which Göethe has made such a noble use in his *Faust*. It is on the Brocken, also, that the wild huntsman of the Hartz is supposed to dwell. The spectre of the Brocken is an image of the spectator, of a magnified and distorted shape, reflected from an opposite cloud under particular circumstances." The best time to see the spectre is in the month of September, about four o'clock in the afternoon. There are many curious caverns in these mountains, each of which has some remarkable story attached to it. Indeed, the whole country may be considered the region of enchantment; and every hill, glen, and wood has been the theatre of some supernatural legend.

BRITISH MOUNTAINS.

THE mountains of Great Britain and Ireland are by no means numerous, and they are very inferior in size to those of the continent.

The most important chain of mountains in England

extends from the Scottish border and the Cheviots to the neighbourhood of Derby; and includes the Cumbrian mountains, and those of Northumberland, Yorkshire and Derbyshire. There are three passages over the Cumbrian mountains into Cumberland, but that by Ambleside is generally preferred, as being the wildest and the most picturesque. It forms a vista of mountains closed at the farther end by Wyburn lake; and of these mountains, the loftiest and most interesting is that called Helvellyn, which has been often celebrated both in poetry and prose, and which is thus described by Gilpin. "Of all the rude scenery we had yet visited, none equalled this in desolation. The whole is one immensity of barrenness. The mountains are universally overspread with crags, and stones, which are sometimes scattered carelessly over their surfaces; and sometimes appear shivering in cascades of crumbling fragments down their sides. Helvellyn, through all its space, is one entire pavement. Nor is the view disfigured by the abundance of this more ordinary species of rock. In its vastness the parts coalesce, and become a whole. The fractured rock, so beautiful in itself, is calculated rather for smaller pictures. Here it would be lost!" In another place he describes one of the lakes as surrounded by barren mountains and precipices, shelving into it in all directions. The height of Helvellyn is very trifling when compared with that of the loftier ranges of mountains; but it approaches that of the Brocken, being a little more than 3000 feet high. Crossfell, Conistonefell, and some other mountains in this range vary from 2000 to 3000 feet in height.

Skiddaw is another celebrated mountain belonging to this range; but Gilpin informs us that "it has none of

those bold projections, and of that shaggy majesty about it, which we expected to have seen in this king of mountains. It is a tame inanimate object; except at such a distance as smooths the embossed work of all these rich fabrics; and where its double top makes it a distinguished object to mark and characterise a landscape."

The most remarkable mountains in Derbyshire, are the High Peak, Matlock High Tor, Mam Tor or the Shivering Mountain, and Thorp Cloud at the entrance of Dove Dale; but, all of these are only hills when compared with the mountains which have been already explained.

Peveril Castle occupies the entire summit of the mount called the High Peak; and on the east and south sides extends a narrow ravine about 200 feet deep; while on the west, the precipice has a perpendicular fall of nearly 300 feet. Even on the north, which is the only accessible side, the ascent is obliged to be carried on by a series of transverse paths.

Mam Tor, or the Shivering Mountain, has received its somewhat singular name from its being composed of alternate layers of shale and grit stone, both which, when the shale decomposes from the influence of the weather, fall into the valley below in detached masses, which make a loud ringing sound, which is sometimes heard as far as Castleton. This constant shivering of Mam Tor has, according to vulgar report, been going on for ages without occasioning any sensible diminution in its bulk, which is very considerable, the mountain rising about 800 feet above the level of the valley, and being almost perpendicular on every side but one.

WELSH MOUNTAINS.

THE Welsh hills lie to the west, and extend from the Irish Sea to the Bristol Channell, occupying nearly the whole of Wales. Of these mountains, Snowdon is the chief, and it rises to the height of upwards of 3,500 feet. South of the Snowdon range, is another stretching across Wales, to the middle of Cardigan Bay, of which Cader Idris is the highest mountain, having an elevation of nearly 3000 feet. The Plynlimmon range only rises in the slopes.

SCOTCH MOUNTAINS.

THE Scotch mountains are of considerable size. In the Grampian range, Cairngorum and several of the other mountains are about 5000 feet high. "The soil of the Grampians is very sterile, and the whole have a very desolate appearance, the sides of the rock being steep, covered with blocks of stone, broken and scattered about. One of the passes is worthy of mention. It is named the Killiecrankie, and it is half a mile in length, being cut out of the mountain, while below, at the foot of a high precipice, the Garry dashes along a ravine over ragged rocks. At the northern extremity of this pass, the army of William III., under Mackay, was defeated in 1689, by the troops of James II., under the well known Graham of Claverhouse, Viscount Dundee, who fell in the moment of victory."

Ben Nevis is the highest of the Scotch mountains, it being nearly 4,400 feet above the level of the sea, and its circumference at the base being about twenty five

miles. Its northern front consists of two grand terraces, the level top of the lowest of which, at an elevation of nearly 2000 feet, contains a mountain lake. The outer acclivities of the lower mountain are very steep, though covered with a short grassy sward mixed with heath. The surface of the upper mountain, on the contrary, is strewed with angular masses of rock of various sizes, wedged together so as to form an excessively rugged covering. On the north east side, there is a broad and terrific precipice, which reaches to a depth of 1,500 feet.

IRISH MOUNTAINS.

THERE are many groups of these, but the principal are the Wicklow mountains, the loftiest of which is about 3,000 feet in height; and the Mourne mountains, some of which are about 2,500 feet high. Slieve-namann in Tipperary; and the Mount Leinster range in Carlow, are also lofty mountains, the height of which ranges between 2,000 and 3,000 feet.

CHAPTER II.

ROCKS.

IN many parts of the world are found rocks of extraordinary shapes, for which it is very difficult to account, but which probably once belonged to mountains partly composed of earths of a softer texture, which have been gradually washed away, or have crumbled into dust. Rocks of various curious shapes are found in almost every part of the world; and though it would fill a volume to describe them all, it will be interesting to give a short account of a few of the most remarkable; particularly as most of these belong to our own country.

BRITISH ROCKS.

The Rocks in Dove Dale take various curious and picturesque forms, some rising abruptly like gigantic needles, and others forming domes, castellated walls, and canopies. In Knight's *Journey Book of England*, the following description is given of Dove Dale, which is nearly three miles long, and takes its name from the river Dove running through the opening in the rocks which forms the dale. This narrow dell is in no place more than a quarter of a mile wide, while

in some places it almost closes, scarcely leaving room for the passage of the river. The hills that enclose the dell are "very precipitous, and bear on their sides fragments of rock that, in the distance, look like the remains of ruined castles. After proceeding a little way, a deep and narrow valley appears, into the recesses of which the eye is prevented from penetrating by the winding course it pursues, and by the shutting in of its precipices, which fold into each other and preclude all distant view. A further progress exhibits an increase of majesty and rudeness in the scene; and the objects, which, at a distance, appeared to be ruins, are found to be rude pyramids, and grand isolated masses of rock ornamented with ivy, rising in the middle of the valley. The rocks which enclose the dale, forcing their scattered and uncovered heads into the clouds, overhang the narrow path that winds through its dark recesses, and frowning in craggy grandeur, and shaggy with the dark foliage that grows out of the chinks, and clings to the asperities of the rocks, form a scene unrivalled in romantic effect. The mountain which rises in the background is known by the name of Thorp Cloud. On proceeding about a mile into the vale, fantastic forms and uncouth combinations are exhibited in vast detached mural masses, while the sides of the dell are perforated by many small natural caverns, which are difficult of access."

There are many other curious rocks in Derbyshire, and amongst others, the curious chasm called the *Lover's Leap*, near Buxton, from which it is said a young girl threw herself who had been deserted by her lover.

Some of the rocks in Devonshire bear considerable

resemblance to those of Dove Dale, particularly the Tors on Dartmoor. Carrington, in the notes to his *Poem* on the wild tract of country, gives the following description of the general appearance of the moor.

“*Dartmoor*, although in some respects an elevated table land, is not strictly a plain, but a series of hemispherical swellings or undulations, gradually overtopping each other, and here and there interrupted by deep depressions, yet without forming what may be called distinct mountains. It is covered with black and brown peat, and crowned at intervals with granitic rocks called tors; some rising like pillars or turrets, others composed of blocks piled together, others divided into horizontal or perpendicular strata, and others so symmetrically arranged as to resemble the ruins of ancient castles. Innumerable masses of stone, more or less rounded and smoothed, lie scattered over the general surface. To a person standing on some lofty point of the moor, it wears the appearance of an irregular broken waste, which may be best compared to the long rolling waves of a tempestuous ocean, fixed into solidity by some instantaneous and powerful impulse.”

Among the more remarkable rocks in this county, Carrington enumerates the following:

Roborough.—“The appearance of this rock, as the passenger travels from Plymouth to Tavistock or Dartmoor, is exceedingly impressive, particularly when it is half veiled by the shadows of evening; and, although no such fact is recorded, it may be considered as likely, in superstitious times, to have been applied to some religious worship. In Dunn’s old map of Devon, it is called Ulster or Ullestor Rock, but it

is scarcely ever so denominated in the present day. The rock itself consists of strata of gneiss [a rock nearly allied to granite], and the points around emerging from the surface are of the same kind of stone." It does not stand on Dartmoor, but on a separate common called Roborough Down, which is supposed, at some former period, to have formed part of the Moor, though it is now separated from it by numerous enclosures.

Dewerstone Cliff.—"The most remarkable cliff in the valley of the Cad is the Dewerstone. This huge mass of rock rises perpendicularly from the margin of the stream to an immense height. Its whole surface is jagged and seamed in the manner so peculiar to granite, which makes the beholder imagine that the stones are regularly piled on each other. It is profusely overgrown with ivy and other creeping plants, which spread their pleasant foliage over its shattered front, as if anxious to bind up the wounds that time and tempest have inflicted. To add to the striking effect of its appearance, numerous hawks, ravens, &c., may be seen floating around its rugged crest and filling the air with their hoarse screamings. He who has sufficient nerve to gaze from the summit of the Dewerstone into the frightful depth beneath, will be amply remunerated for the trouble which may be experienced in ascending. The rocks immediately beneath the view seem as if they had been struck at once by a thousand thunderbolts, and appear only prevented from bursting asunder by chains of ivy. A few wild flowers are sprinkled about in the crevices of the cliff,—tufts of broom wave like golden banners in the passing breeze, and these, with here and there a mountain

ash clinging half way down the precipice, impart a wild animation to the spot."

Hound Tor, near Ilsington, is "a magnificent group of rocks, like the remains of some ruined castle, rising in the horizon with its beetling front from the dreary plain; its toppling crags having the appearance of pinnacles, which the hand of time has loosened; and as it throws its dark shade across the heath, it increases the natural wildness of the desolate downs, in the midst of which it is situated."

Sheep's Tor is both grand in feature and stupendous in dimensions, its base covering a space of more than a hundred acres, and being, according to an ancient prophecy, rich in all kinds of minerals. Even gold has been found in the river, apparently washed down from the rock; and enough of this precious substance was collected some years since, by a miner named Wellington, to sell at Plymouth for forty pounds.

"The scenery around *Lydford* is singularly picturesque and romantic; but the most prominent objects of curiosity and admiration are, the Bridge and the two Cascades. The former bears great analogy, in situation and character, to the celebrated Devil's Bridge in Wales. It consists of one rude arch, thrown across a narrow rocky chasm, which sinks nearly eighty feet from the level of the road. At the bottom of this channel the small river Lyd is heard rattling through its contracted course. The singularity of this scene is not perceived in merely passing over the bridge: to appreciate its character, and comprehend its awfully impressive effects, it is necessary to see the bridge, the chasm, and the roaring water, from different projecting crags which impend over the river. A little

distance below the bridge the fissure gradually spreads its rocky jaws; the bottom opens; and instead of the dark precipices which have hitherto overhung and obscured the struggling river, it now emerges into day, and rolls its murmuring current through a winding valley, confined within magnificent banks, darkened with woods which swell into bold promontories, or fall back into sweeping recesses, till they are lost to the eye in the distance. Thickly shaded by trees, which shoot out from the sides of the rent, the scene at Lydford bridge is not so terrific as it would have been, had a little more light been let into the abyss, just sufficient to produce a darkness visible. As it is, however, the chasm cannot be regarded without shuddering; nor will the stoutest heart meditate unappalled upon the dreadful anecdotes connected with the spot."

The valley of rocks at Linton, in the north of Devonshire, from its wild and desolate appearance, presents a singular contrast to the high cultivation of the surrounding country. The road to this singular valley leads through numerous chasms, like hollows, which are bordered by rocky precipices thickly clothed with wood, reaching down to the sea, or rather, to the mouth of the Severn, which here forms a considerable estuary.

As the traveller advances, all appearance of wood and foliage vanishes, and the scene changes to "a valley bounded by large naked rocks, or rather, fragments of rocks, piled one upon another. The heights on each side are of a mountainous magnitude, but composed, to all appearance, of loose unequal masses, which form here and there rude natural columns, and

are fantastically arranged along the summits, so as to resemble extensive ruins impending over the pass." Advancing into this extraordinary valley, a magnificent view of the Severn presents itself through an abrupt opening in the rocks. The valley is nearly a mile long, but it is not above 300 feet wide; so that the idea that presents itself is, that the valley was once the bed of a vast and impetuous torrent, which, from the broad openings towards the sea, and the rugged summits of the mountains on that side, would seem to have poured itself into the Severn at the western extremity.

Nearly in the centre of the valley are some stone circles, which are supposed to be Druidical remains; and in several places immense blocks of stone are found, that appear of a different texture to those which constitute the natural rocks.

Previously to the year 1824, there existed a very curious rock on the south coast of Devonshire, near Sidmouth, which was called *Chit Rock*, and was, in fact, a mass of indurated clay, rising up at some distance from the coast when the tide was up, though it could be easily reached at low water. It was, however, completely washed away by a great storm which took place in November, 1824.

In Cornwall and some other places, the action of the weather has, in several instances, worn away part of the jointings of large blocks of granite, which are in consequence left resting on a kind of central pivot, and are, from that circumstance, easily moved, notwithstanding their immense weight and bulk. Some of these are called logan or rocking stones, because they are so nicely balanced, as to be in continual



THE CHEESE WRING.

motion; others are fixed; and among these latter is the celebrated pile of rocks called the *Cheese Wring*. The Cheese Wring is a natural pile or combination of eight rough granite rocks, rising to the height of thirty-two feet, and standing near the top of a high hill. The stones are placed one above another; and from the shape of some of them resembling a large cheese in an old fashioned press, the pile has obtained its name.

The upper and middle stones are much larger than those below. "The uppermost was formerly a logan, or rocking stone; but, part of it having been broken off, the equipoise was destroyed, and it is now immovable; on the top were two hollows or basins, one of which is yet whole. The great weight of the upper part, and the slender bearing between the third and fourth stones, have excited much admiration how such an ill-constructed pile could resist the storms of such an exposed situation for so many ages. On the same

hill are several other smaller piles of granitic rocks and one of the stones is of the enormous measurement of eleven yards in length, and nine in breadth, the thickness, on a medium, being little more than two feet. The hill is of a conical shape, and the diameter of the summit is about one hundred yards. Round the top is an immense number of small stones, seemingly ranged by art, and forming a rampart of wall. Within the circle are many large masses of rocks, with excavations on the tops of some of them, called rock basins; these are nearly regular and uniform, and generally two together, with a spout or channel between them.

The *Kilmarth rocks* form a lofty range about half a mile in length. They are about two miles from the Cheese Wring, and stand in the Parish of Linkinhorn. The highest pile is about twenty-eight feet, and it overhangs so much to the north, that, when viewed from the east, it looks as though a strong man could easily push it over. When examined on the west, however, it is found to be quite firm. The stones of which it is composed are all of granite.

Trevethy Stone is another remarkable pile of rocks near Liskeard in Cornwall. It consists of six upright stones, and one laid on them horizontally, the latter appearing to have been placed by the hand of man.

Another very remarkable stone, which bears some traces of the hand of man, is to be seen on the summit of *Carnbrae*, near Redruth. "The surface of the rock is hollowed into several basins; between the higher and lower basins is a communication by an open breach in their common separation; sometimes the depth of this breach is the same as that of the upper basin, and thus that basin is completely drained; in other cases,

a second and a third are in the same manner left dry. Occasionally, a small cistern of the clearest water is found in these hollow places; a striking circumstance to the beholder, both from the nature of the contrast, and the seeming improbability of such an occurrence. It must be remarked that the surface of the whole rock, and particularly of the interior of these basins, exhibits a decidedly water-worn appearance; and, not unfrequently, a considerable sediment is found in these little wells, evidently derived from the wearing of the rock, as it consists of crystalline particles, belonging to the substance of the rock, and bearing the same appearance as the surface of the whole mass." The block is in a slanting position, and looks as though the least touch would make it slide downwards. It is, however, perfectly steady, and will probably remain in its present position for centuries, unless it should be subjected to any violent convulsion of nature. There are many of these basins in Cornwall, where they are called kettles and pans; and there are also some in the Scilly Islands.

The *Logan Stone*.—At Castle Treryn, about two miles from the Land's End, is a stupendous group of gigantic rocks, which rise in pyramidal clusters to a great height, and overhang the sea. On one of these pyramids lies the celebrated Logan Stone, an immense block of granite, weighing about sixty tons, which is so nicely balanced, that the strength of a single man is sufficient to make it rock to and fro. In the year 1824, a young man, a lieutenant in the Preventive Service, with the assistance of his men, very foolishly threw this stone off its balance, but when it was made known that he had done so, the Board of Admiralty compelled him to

replace it at his own expense, and it took the labour of sixty men for three days to do so.

At *Scratchell's Bay*, in the Isle of Wight, is a magnificent arch, 150 feet high, which is one of the numerous bays that pierce Fresh-water Cliffs, some of which are 400 feet high, and one 600 feet. At a little distance from this natural arch, are the singular looking rocks called the Needles, a name which they are said to have derived from one of their number, which rose about 120 feet above low-water mark, but which fell in the year 1764. There are several other remarkable rocks in the Isle of Wight, particularly the Pulpit Rock, near Bonchurch, Black Gang Chine, Culver's Nass, and many others, as the rocks there consist chiefly of a species of hard sandstone mixed with clay, and hence, as the clay is more easily acted upon by the weather than the sandstone, it crumbles away in situations where the sandstone is left.

At Tonbridge Wells are several curious rocks, jutting out from the ground, and rising to the height of from forty to seventy feet. These rocks are of sandstone, and some of them, such as the *toad rock*, are of very curious shapes. The Eridge rocks in this neighbourhood are remarkable for their beauty.

In Wales there are many remarkable rocks, but none are more extraordinary than those in Cardiganshire, South Wales, between Hafad and Aberystwith, over which a curious bridge has been built, the difficulties of the construction of which must have been exceedingly great. The bridge is thrown across a deep rent or chasm in the rocks, through which, about 118 feet below the arch, the river Mynach forces its way, and after flowing onwards for a few yards, dashes down in a

succession of cataracts to the depth of upwards of 300 feet. At each end of the bridge there is a steep rough path down the rocky sides of the chasm to some ledges hanging over the stream, where the visitor may stand almost immediately under the arch of the Devil's Bridge, as it is called, and enjoy the full effect of the scene. The rocks are more beautiful than in most similar situations, as they are richly covered with foliage; and on looking upwards from the bottom, the glittering leaves and waving branches produce the happiest effects.

Coldwell Rocks are on the banks of the river Wye, which are celebrated for their beauty, and they form, according to Gilpin, the first grand scene on the Wye, as they stand in naked grandeur amidst immense masses of foliage.

In Scotland there is in the heart of the north Highlands a narrow pass between the mountains in the neighbourhood of Bendearg, which, at a little distance, has the appearance of an immense artificial bridge thrown over a tremendous chasm, but which is, in fact, formed of vast and rugged bodies of solid rock, "piled on each other, as if the giant sport of the architect. The sides of this pass are in some places covered with trees of a considerable size, and the passenger who has a head steady enough to look down the precipice, may see the eyries of birds of prey beneath his feet. The path across is so narrow, that it cannot admit of two persons passing alongside; and, indeed, none but natives accustomed to the scene from infancy, would attempt the dangerous route at all, though it saves a circuit of three miles. Yet it sometimes happens, that two travellers meet in the middle, owing to the curve formed

by the pass preventing a view across from either side; and when this is the case, one is obliged to lie down while the other crawls over his body." There are many other curious passes in the Highlands, but it would take too much space to give detailed descriptions of them.

CONTINENTAL ROCKS.

THE *Risenberg*, or *Giant's Castle* in Franconia, "is a rock of most stupendous height, and the number of recesses, windows, arches, rooms, &c., in its interior is truly astonishing. But the attention is forcibly struck with a most singular freak of nature, the form of a human being of gigantic dimensions, in the rocky roof of one of the halls; the head, limbs, and ribs are distinctly developed. The castle derives its name from this figure."

At Hirniskretschen in Bohemia, there is what is called the *Prebischethor*. This extraordinary caprice of nature has all the appearance of a triumphal arch of the most colossal proportions; and, being situated in the midst of the wildest scenery, forms, as it were, a frame to the immense picture seen through it in the distance. The top of the arch is upwards of 1400 feet above the level of the sea. Nearly adjoining, there is also an isolated rock in the shape of a cone, and an inaccessible chasm 1200 feet in depth.

In Silesia, at Audersbach, is an extraordinary labyrinth of rocks, four leagues in length, and two in breadth. These rocks are entirely composed of sandstone, and at first sight they look like a city of gigantic architecture in ruins, for we can literally walk through

the interior of the labyrinth "as we would in the squares and streets of a town, and it hardly requires a stretch of the imagination to say that we see dismantled towers, triumphal arches, dilapidated fortifications, &c. Tradition has baptized many of these masses of rock with the most fanciful appellations: here we have the statues of burgomasters and soldiers, there friars and nuns, and in another place the emperor's throne. One of the loftiest of these rocks, termed the watch-tower, is, I should think, between 400 and 500 feet high, but its circumference is not more than that of the object from which it borrows its appellation. Another of nearly equal altitude, which goes under the name of the Zuckerhut (sugar-loaf,) is, in form, an inverted cone, and being isolated, and at some distance from all the rest, has a most singular appearance."

At Golling, in the Tyrol, the river Salza forces its passage through ravines and mountain defiles. In one place, "the stream has perforated the rock in its descent, and falls in a sort of curtain over the lower part of it into the channel at the foot. Over these falls, and about half-way up the mountains, there is a splendid arch or natural bridge."

At Virginia in North America, over a small stream, in the upper part of the great Valley of Shenandoah, is a splendid natural curiosity, called the Rock Bridge. "It is a noble arch of one solid mass of stone, somewhat curved in its highest part, and almost like the work of man. The same native rock forms on each side the supports of this enormous arch, which is said to be about eighty feet wide near the top; at the level of the water the width is only forty feet. The whole height from the outer top of the arch to the water, is

about 210 feet, as ascertained by admeasurement with a string and a stone at the end; the vertical thickness of the arch is probably about thirty-feet. The stream which runs beneath, though inconsiderable, adds to the general effect. Drops of water filter through the limestone, and fall in quick succession from the arch, and, by the time occupied in their descent, their increasing velocity, and their full bright appearance, serve in some degree to give a measure of the height from which they fall, and increase the beauty of the scene." There is another natural bridge in Virginia, in Scot country, which is said to be above 340 feet high.

Mr. Fortune, in his *Wanderings in the Northern Provinces of China*, mentions that he met with "some immense blocks of stone (granite), supported naturally on the tops of the hills in the strangest manner, which are objects of great interest to the traveller. One, in particular, appears as if some giant arm had raised it to its present position, and left it there solely to astonish the beholder in after ages, and leave him to wonder not only how it came there, but how it could remain in its present position, and, most assuredly, a very small quantity of gunpowder exploded below it, would hurl it from the hill into the plain beneath."

SAND HILLS IN SOUTH AUSTRALIA.

MR. ANGAS describes the sand hills or drives near the river Coorong in South Australia as being of immense height, and presenting the appearance of barren mountains. In one place, he says, there is "a vast chasm, resembling an extinct crater, which

rent these sandy heights, surrounded by masses of sandstone and projecting rocks. In every direction were seen hollow tubes of sand, cemented by moisture and lime, rising perpendicularly, and varying in height from two to twelve inches; appearing as though they had originally been formed by a gathering of lime and sand around sticks, which having decayed, had left the hollow tubes." A granite ridge, near this, creeps up in a series of fungus-like rocks; but no other granite is found along the coast. In another place were found some limestone hills perforated by the burrows of the Wombats.

CHAPTER III.

VOLCANOES.

IF burning mountains were not so common, they would be considered almost as miracles; but, like everything else, being frequently met with, they are comparatively little regarded. Various theories have been started to account for these phenomena, which seem to spring from some internal fire in the bowels of the earth, which occasionally breaks forth and discharges fire and smoke, together with a stream of melted stone and ashes, over the surrounding country. There are numerous volcanoes in various parts of the world, but as those of Europe are best known, a short account of them will be first given.

MOUNT ÆTNA.

THIS mountain stands on the eastern part of the island of Sicily. It is upwards of 10,000 feet high, and its summit is covered with snow, in the centre of which rises a little mountain about a quarter of a mile perpendicular, the sides of which are very steep. The plain or table-land from which this mountain rises, is about nine miles in circumference; and the

little mountain is, in fact, the crater or mouth from which the flames proceed. It is formed entirely of stones and ashes, and in the middle there is a hollow about two or three miles in circumference, the inside of which is covered over with salts and sulphur of different colours. It goes shelving down like an inverted cone, the depth of which nearly corresponds to the height of the smaller mountain. From many parts of this crater issue volumes of sulphureous smoke, which, being much heavier than the superincumbent atmosphere, instead of ascending, rolls down the side of the mountain, till, coming to a more dense atmosphere, it shoots off horizontally, leaving a conspicuous track behind it. Loud noises are frequently heard from the crater, and before an eruption they increase to such a degree, as to be heard at a very considerable distance. The form of the mountain is a cone, very broad at the base, which is more than forty miles in circumference. The whole of the mountain is covered with volcanic substances, and near the base, these are mingled with so many marine bodies, that the mountain appears at some not very distant period to have been washed by the sea. The mountain is divided into three distinct zones, which are called the cultivated region, the woody region, and the desert region. The trees in the woody region are remarkably fine, and the cultivated ground is very fertile.

MOUNT VESUVIUS.

MOUNT VESUVIUS is situated on the shore of the Bay of Naples. It is little more than four miles

from the city of Naples; its base occupies an irregular space of about twelve miles in circumference; it rises conically to the height of about 3000 feet, and terminates in two peaks, one of which contains the crater. It is one of the extraordinary circumstances relating to this mountain, that though it has frequently overwhelmed the towns and villages at its base, the inhabitants have persisted in building fresh towns in exactly the same position as those that have been destroyed. The first fearful eruption of which we have any account was in 79, nearly two thousand years ago, by which, in the month of August in that year, the cities of Herculaneum and Pompeii were destroyed; not, as is sometimes supposed, by a stream of burning lava, but by showers of ashes, as is proved by the excavations which have been made. It was at this eruption that Pliny, the naturalist, venturing too near the mountain, lost his life. Several other eruptions followed, till in the year 1588, a new mountain suddenly appeared beside the old one. In 1779 a violent eruption took place, which was witnessed by Sir William Hamilton, who has left a detailed account of it. In 1822 was another considerable eruption, which continued more than twenty days. During this eruption a new crater was formed, from which since that time fire has continued to issue in the same way as from the old one. In every case when an eruption has taken place, it has been preceded by a fearful bellowing noise, which is generally heard for several days. When the eruption begins, the mountain throws up immense columns of fire, shrouded in the blackest smoke, and mixed with sand so fine, as to fill the eyes and ears with an almost impalpable powder. The fearful bellowing is repeated

before each fresh explosion; and the flames when they burst forth, rush upwards with such force, as to carry with them not only large stones, but pieces of rock. The smallest stones appeared of the size of cannon balls; the greater number were like bomb-shells, but others were pieces of rock, five or six cubic feet in size, and some of most enormous dimensions; the latter generally fell on the ridge of the crater, and rolled down its sides, splitting into fragments as they struck against the hard and cutting masses of cold lava. Some of these stones, even when on fire, are extremely hard, but the larger ones are a complete paste of fire, and whilst at a red heat are easily divided. The stones are not always thrown up perpendicularly in the shape of a pillar of fire, but sometimes like a widely spreading sheaf, producing the most brilliant effect imaginable. The lava of Mount Vesuvius rarely extends above seven miles from the crater, while that of Mount Ætna flows to a distance of sometimes twenty and even thirty miles.

MOUNT HECLA.

THIS volcano, which has three summits, and is about 5000 feet above the level of the sea, lies about four miles from the southern coast of the island of Iceland, in full view of the ships sailing to Greenland and North America. "The surrounding territory has been so devastated by its eruptions, as to be entirely deserted; and the natives assert that it is impossible to ascend the mountain, on account of the number of dangerous bogs which are constantly emitting sulphureous flames and smoke." The more elevated and central summit is

covered over with boiling springs and large craters, from which smoke is constantly issuing, and occasionally fire. When Sir Joseph Banks and his companions visited this mountain, they had to pass over a tract of land, seventy miles in extent, which was entirely covered with lava, and they found in one place a small lake, bounded by a perpendicular face of rock, covered with hardened lava, which resembled glass.

THE ORÆFA MOUNTAIN IN ICELAND.

THIS mountain, which is the loftiest in Iceland, has been rendered celebrated by an eruption which took place about a century ago. Nothing can be more striking than the account given of this calamity by the aged minister of the parish. He was in the midst of his service on the Sabbath, when the agitation of the earth gave warning that some alarming event was to follow. Rushing from the church, he saw a peak of the neighbouring mountain alternately heaved up and sinking; till at last the stone of which this portion of the mountain was composed ran down in a melted state into the plain, like melted metal from a crucible, filling it to such a height that no more of the mountain, which formerly towered to such a height, remains than about the size of a bird; volumes of water being in the meantime thrown forth in a deluge from the crater, and sweeping away whatever they encountered in their course. "The Oræfa then broke forth, hurling large masses of ice to a great distance; fire burst out in every direction from its side; the sky was darkened by the smoke and ashes,

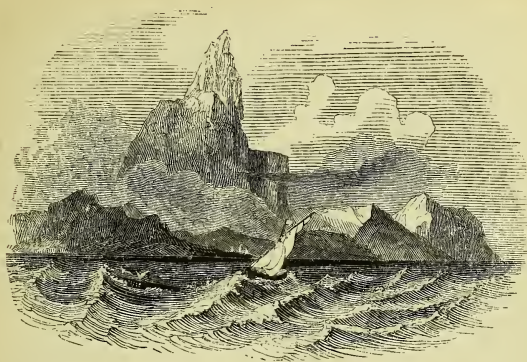
so that the day could hardly be distinguished from the night. This scene of horror continued for more than three days, during which the whole region was converted into utter desolation."

COTOPAXI.

THIS volcano is situated in the Andes, and it is certainly the loftiest in the world, being upwards of 19,000 feet high. Its flames rise to the height of 3000 feet above the brink of the crater, and its bellowings are heard at the distance of several hundred miles. Humboldt, indeed, says that he heard them even when sailing on the Pacific Ocean. As the summit of this mountain rises above the line of perpetual frost, and consequently is covered with snow, whenever a fiery eruption takes place, the snows in and around the crater are melted and descend in torrents, sweeping away the towns and villages at its base. On one occasion a village thirty leagues distant was thus overwhelmed.

SMALLER VOLCANOES.

THESE are very numerous, and their action is different in different parts of the world. Sometimes a mountainous island is thrown up, which, after vomiting fire and smoke for some days, or even weeks, disappears; and in other cases, volcanoes, instead of vomiting fire and smoke, throw up showers of mud and water, with which dead fishes are sometimes mingled.



THE PEAK OF TENERIFFE.

THIS celebrated volcanic mountain occupies nearly the whole of one of the Canary Islands, a group situated on the western coast of Africa, and which, probably, all owe their origin to the action of a submarine volcano. The island of Teneriffe is divided in the middle by a ridge of mountains, which has been compared to the roof of a church, the celebrated peak, resembling a spire, rising from the centre. Five-sixths of the island are composed of rocks, woods, and inaccessible mountains, but the remainder is extremely fertile. The peak itself is about 12,000 feet above the level of the sea, and in clear weather it forms a very majestic object when seen from the anchorage of Saint Croix. Unfortunately, however, the mountain is enveloped in clouds for a great part of the year, and travellers sometimes pass several weeks at Saint Croix without obtaining a view of it. "Its position to the

west of a great continent, with its isolation in the midst of the sea, are doubtless the causes of this phenomenon." The crater of the mountain is only 300 feet by 200, and its depth does not exceed 100 feet. The peak does not terminate in a simple cone like most other volcanoes, but it has on its crest a kind of circular wall, which surrounds the crater, and which at a distance has the appearance of a cylinder placed upon a truncated cone. The interior of the crater is covered with yellow and white clay, and fragments of decomposed lava, under which are found beautiful crystals of sulphur. Smoke constantly issues from the summit, but it has never been known to emit flames. It is supposed, indeed, that what may be called the chimney probably operates in saving Teneriffe from the destructive eruptions to which other volcanic islands are subject. The Peak of Teneriffe has been frequently ascended, but as it is generally covered with clouds, the view seldom repays the visitor for the time and trouble of the ascent. The most remarkable object is what is called the ice cave, which is situated just below the sugar-loaf or cone, and in which there is a spring of the coldest possible water, which is distilled very gently through the lava rocks above the cave, and is remarkably pure.

VOLCANIC MOUNTAIN IN NEW ZEALAND.

MOUNT GAMBIER, a volcano in New Zealand, is composed of the united shells or walls of three distinct craters (each containing a lake of water), that rise in abrupt peaks from a rich and level country, composed of

a dark volcanic soil. "After toiling up the outward slopes of the mountain, at the most accessible place we could find," observes Mr. Angas, "the sudden view of the interior of the largest crater burst upon us, and called forth our rapturous admiration. It was, indeed, a glorious and enchanting scene: a vast hollow basin, as it were, shut out from the world by the walls of lava that surrounded it, and covered with emerald verdure, burnished to a bright metallic green by the golden tints of evening, that now lit up with a fairy-like radiance this smiling solitude, once the region of subterranean fires. Small hills, like miniature craters, interspersed among plains and valleys carpeted with grass of the most velvet smoothness, scattered about with a few blackwood or mimosa trees, formed one portion of this enchanted dell. At its western extremity, terrace above terrace rose, along the side of the mountain; and caverns of beautiful red lava opened here and there. But the most fascinating sight, as we stood gazing on this scene of preternatural beauty, was the deep still lake that filled the other half of the crater: its black volcanic waters, never ruffled by the wind, lay in calm repose at the base of lofty cliffs of pure white coral, every line of which was mirrored on its tranquil bosom. Some tern were skimming over the lake, and several smaller lakes or ponds ornamented the green carpet of this wondrous spot, that appeared more like some scene of enchantment, conjured up by the magic wand of Prospero, than a bright and palpable reality. The declining sun threw orange and amber reflections across the sky; and as the light faded away, the steep walls of the crater loomed solemn and terrible, the cold mists of night settled upon the lake, and the scene

of fairy loveliness was changed to one of lonely grandeur. All was still, save the shrieking of the owl; and as the moon rose up from behind the dark peaks of lava, the effect was beautiful in the extreme: the soft silvery light bathing every object in that vapoury splendour which added sublimity to the landscape. We bivouacked for the night within the crater, our fires glimmering like stars along the edge of the lake."

VOLCANIC ISLANDS OFF THE AZORES.

DURING the night of the 1st of February, 1811, flames were observed issuing from the sea, about a mile and a half from the Island of St. Michael's, and shortly after a most awful and tremendous explosion took place, throwing up from an enormous depth, cinders, ashes, and stones of immense size. Quantities of fish, which appeared as if boiled, floated on the surface of the sea towards the shore, and a British sloop-of-war, seeing columns of smoke issuing from the sea, supposed an engagement was taking place, and hastened to the spot. It was, however, a very dangerous place for any ship to venture in, for in the very situation where, only a few hours before, the sea had been forty fathoms deep, a dangerous shoal had been formed by the substances thrown up by the eruption. The following June an earthquake was felt at St. Michael's, and a few days afterwards two columns of white smoke were seen rising from the sea, and they were followed by a succession of explosions, which continued to rise from the sea till the 18th of June, when the crater of the volcano was first seen appearing above the waves.

It rose rapidly, and in the course of a few hours was thirty feet above the water; and on the 19th it was fifty feet high, and two-thirds of a mile in length, raging most furiously, and throwing up immense quantities of stones, some of which fell a mile distant from the volcano. Water also boiled up furiously, and when it fell was accompanied with vast quantities of black sand. In this manner it continued raging for several days, and increasing rapidly in size. At length the volcano became quiet, and when it was visited on the 4th of July, by the captain and officers of the British sloop *Sabrina*, it was found that a perfect island had been formed with a mountain in the centre between two and three hundred feet in height. In the middle was a large basin of boiling water, whence a stream, about six yards across, fell into the sea, facing St. Michael's, and this water, at fifty yards from the shore, though it was thirty fathoms deep, was too hot to hold the hand in. Subsequently the island sank gradually into the sea, and by the middle of October, no part of it was left above the water, though it was found a dangerous shoal had been formed, which still remains.

VOLCANIC ISLAND OFF SICILY.

IN July, 1831, a party of English gentlemen who had passed the night in a small boat on the sea, off the coast of Sicily, were awakened a little before sunrise by a violent explosion, which arose from a sand-bank which was generally covered with water, and which was known to mariners by the name of *Nerita*; and looking in the direction whence the sound

proceeded, they found the place formerly occupied by this island, filled by two hills surrounded by a column of smoke. As the sun rose in all his glory behind the hills, they found that the highest was about one hundred and twenty feet above the level of the sea; and rowing round the island, they found that on one side there was a portion of flat sandy shore; they landed, and soon after they mounted to the edge of the crater, which they found was placed between two cones, which had appeared at a little distance to be two distinct hills. The form of the crater was very irregular: within it, about forty-five feet below its lip, they saw two small lakes of boiling water. While the party from the boat were examining the island a rumbling noise was heard, which terrified them so much that they hurried away, and they had hardly rowed themselves clear of the island when they found another was rising from the sea, which opened to an immense depth, as though to allow of its expulsion. The first island, when examined by the boat's crew, was about two miles in circumference, but it diminished daily, and by the following October, it had entirely disappeared.

THE ISLANDS OF ISCHIA AND PROCIDA.

THERE are several volcanoes in the islands of Ischia and Procida, and Strabo states that the latter island was torn from the former during an eruption. Both islands appear to be of volcanic origin, and about the time of the Christian era, it was found impossible to inhabit either of them, on account of their frequent eruptions, earthquakes, and sulphureous exhalations.

The principal mountain in the centre of Ischia, *Mount Epomeo*, has no less than twelve volcanic cones. It is composed of greenish stone mixed with hardened lava, and it is about 2,600 feet high.

Monte Rotaro was thrown up by an eruption in the lower part of the island; the cone is remarkably perfect; and the hill itself is so fertile that it is covered with the arbutus and other evergreens nearly to its summit.

Monte Nuovo was thrown up by a violent eruption in the year 1538. On the 29th of September in that year, two hours after sunset, a gulf opened between the little town of Tripergola, which once existed on the site of Monte Nuovo, and the baths in its suburbs, which were much frequented. The gulf opened with a tremendous noise, discharging pumice stones, blocks of unmelted lava, with ashes mixed with water and occasional flames. The sea retired suddenly for a space of 200 yards, and a portion of its bed was left dry. The eruption continued till the 3rd of October, and when it ceased, the town and the Lucrine Lake, which lay just below it, had disappeared, and in their stead was left a hill about 450 feet above the level of the bay, with a base nearly a mile and a half in circumference; while the whole of the sea-coast, as far as the town of Puzzuoli, was raised several feet above the bed of the Mediterranean.

THE PHLEGRÆAN FIELDS.

THIS celebrated region, which is situated between Baiæ and Naples, contains *Monte Nuovo*, *Monte Barbaro*, which is covered with vineyards, the *Lake Avernus*, formerly noted for its sulphureous vapours, and the *Solfatara*, or *Lake of Sulphur*, which has a stream of warm water flowing through it, containing so much carbonic acid gas that it appears to be actually boiling.

The Islands of Lipari are all volcanic. Lipari itself is remarkable for what are called its stoves. These consist of five caverns or grottoes, two of which cannot be entered on account of their intense heat. The stones even on the outside are so hot that they cannot be touched without giving pain; and from a slight crack or fissure in the floor of one of the grottoes, issues a thin stream of sulphureous vapour which is almost suffocating.

Vulcano, which has given the name to all the other burning mountains, is the next island to Lipari; and it was believed by the ancient Pagans, that in this island Vulcan erected the furnace at which he forged the thunderbolts of Jove, and hence the name. The mountain is in the form of a truncated cone, but it is merely a case enclosing another mountain, in which the crater or mouth of the volcano is situated; the outer case being open only on that side which is washed by the sea. The ground in this island is covered with large pieces of pumice stone, and if any of these be struck with a hammer, it gives out a low hollow sound, as though there were a large cavern below it. In

March, 1786, the crater of this volcano threw out a prodigious quantity of sand, which covered every place in the neighbourhood to the depth of several feet, besides much more which fell into the sea.

Stromboli is the largest of the Lipari Islands, and the volcano is a conical mountain upwards of 2,000 feet high, and about nine miles in circumference; and it differs from the other volcanoes in being continually burning. It has also frequent explosions, which sometimes follow each other in quick succession; and as a shower of red hot stones is thrown up with each explosion, it closely resembles a bombardment of artillery. In some cases it is scarcely possible to land without danger, though the island has 1,200 inhabitants, and its vines produce some of the finest wines of the Mediterranean.

A volcanic island was elevated near Iceland in the year 1783; and shortly afterwards one of the minor volcanoes of that island threw out a stream of lava which completely choked up a river, and destroyed nearly twenty villages, and 9,000 human beings. This eruption produced the largest body of lava ever witnessed. The lava was in two streams, the longest of which was fifty miles, and the other forty miles in length; and both varied from seven to fifteen miles in breadth. The ordinary thickness was 100 feet, while in some places it was as much as 600 feet.

OTHER VOLCANIC ISLANDS.

THERE are several other islands of a similar nature in different parts of the world, but among the more remarkable may be mentioned the *Sulphur Island* in

the Japanese Sea mentioned by Captain Basil Hall. The sulphuric volcano, from which the island takes its name, is on the north-west side. It emits white smoke, and a smell of sulphur is very strong on the lee side of the crater. The cliffs near the volcano are of a pale yellow, interspersed with brown streaks; the ground is very rugged; and on the top is a thin coat of brown grass. The south end of the island is of considerable height, of a deep blood-red colour, with here and there a spot of bright green. Sir Stamford Raffles, in his *History of Java*, records a fearful eruption, which occurred in the *Island of Sumbawa* on the 5th of April, 1815.

The sound of the explosions was heard at Sumatra, a distance of upwards of 900 miles; and of 12,000 persons who were on the island, only six and twenty survived the catastrophe. "This fearful visitation was accompanied by hurricanes, which carried up into the air men, horses, and other animals, and, uprooting the largest trees, scattered them on the surrounding sea; such a fall of ashes occurred during the eruption that they rendered houses uninhabitable which were forty miles from the volcano, and were carried in such quantities towards Java and Celebes as to darken the air for 300 miles; while those which fell into the sea to the west of Sumatra, formed a bed of two feet thick and several miles in extent, which impeded ships in their progress. In Java, in the day-time, these ashes produced a darkness more perfect than that of any night. The sea rose suddenly on the coast of Sumbawa and the adjoining islands from two to twelve feet, causing a wave, which rushed up the rivers, and then as suddenly subsided; and in one place overflowed a town called Tomboro, and remained permanently at a depth of

eighteen feet, on a spot where there had before been dry land. The area over which noises, and other indirect effects of this convulsion were perceived, was 1,000 English miles in circumference."

The *Island of Owhyhee*, in the Sandwich group, is all volcanic. It comprises an area of about 4,000 square miles, and its loftiest mountains are 15,000 or 16,000 feet above the level of the sea. The principal volcano is, however, about twenty miles from the sea-shore ; and its crater is surrounded by steep rocks, forming an immense wall many miles in extent. "On visiting this crater," Mr. Ellis informs us, "he found it an immense gulf in the form of a crescent, about two miles in length, and one in breadth, and apparently about 800 feet deep. The bottom was covered with lava, forming one vast flood of burning matter in a state of terrific ebullition, rolling to and fro its 'fiery surge' and flaming billows. Fifty-one conical islands, of varied form and size, containing so many craters, rose either around the edge or from the surface of the burning lake. Twenty-two constantly threw out columns of grey smoke, or pyramids of brilliant flame ; and several of these at the same time vomited from their burning mouths streams of lava, which rolled in blazing torrents down their black and rugged sides into the boiling mass below."

There are several other volcanoes in different parts of the world, particularly in the Andes, where some of the volcanoes vomit forth streams of boiling mud instead of fire ; and in the Caucasian range, where the lava is mixed with naphtha. Many of the detached groups of islands have also been formed by volcanic action, and amongst others, the Philippine Isles.

CHAPTER IV.

CAVERNS.

CAVERNS are naturally associated with mountains, as in most cases they are found together. A cavern has been defined to be an opening produced by nature in the solid crust of the earth, but it often appears to be the effect of crystallization. Caverns are generally divided into three classes, those which are merely wide clefts in the rock ; those which admit daylight at both ends, and sometimes serve as the bed of a river ; and those which consist of a succession of grottoes, united by openings or narrow passages, and often contain rivers. It is only the last kind that properly deserve the name of caverns, and there are some of immense size. When caverns are produced in limestone rocks, they are generally ornamented with stalactites, some of which are extremely beautiful, and which take an extraordinary variety of forms. New caverns are frequently being discovered ; and doubtless many exist which are not yet known ; as they appear to have been formed in the centre of a mass of melted rock, when the outside has cooled rapidly by imprisoned air or water ; just as a bubble of air often forms a cavity in a mass of alum, or gum-varnish which has been melted to form some fancy article of female industry, and which has been suffered to cool too rapidly. All the largest caverns have a stream of water running through them.

ENGLISH CAVERNS.

THESE are very numerous, as limestone is not only very abundant in different parts of the country, but it has been so much worked, as to open most of its recesses. The following are a few of the most remarkable.

THE PEAK CAVERN.

THE Peak Cavern is situated about 100 yards from the little town of Castleton in the romantic valley called Castleton-Dale, in Derbyshire. The valley, which is about six miles in length, and two in breadth, is celebrated for the beauty of its scenery. Near the entrance to the cavern, huge grey rocks rise almost perpendicularly to the height of nearly 300 feet on both sides, while on the left, a rapid rivulet foams over broken crags and masses of limestone. The mouth of the cavern is formed by a vast canopy of rock, which assumes the form of a depressed arch, nearly regular in its structure, 120 feet in width, forty-two feet high, and above ninety feet in receding depth. The effect of this magnificent natural vestibule is, however, entirely destroyed by the erection of a number of paltry looking posts, like those used for drying linen, and which are employed in making twine or rope; so that, to the disgrace of British taste, one of the grandest natural objects in Great Britain, is turned into a paltry rope walk. This is, indeed, suffering the spirit of commerce to pervade everything. "After penetrating about thirty yards into the recess, the roof becomes

lower, and a gentle descent conducts by a detached rock to the immediate entrance of the interior hollow, which is closed by a door kept locked by the guides. At this point, the light of day, which had gradually softened into the obscurity of twilight, totally disappears, and torches are employed to illuminate the progress through the darkness of the cavern. The passage then becomes low and confined, and the explorer is obliged to proceed twenty or thirty yards in a stooping posture, when he comes to another spacious opening, whence a path conducts to the margin of a small lake, locally called the 'First Water,' which is about fourteen yards in length, but has not more than three or four feet of depth. Here there is a small boat, partly filled with straw, on which the visitor lies down, and is conveyed into the interior of the cavern under a massive arch of rock, which is about five yards through, and in one place descends to within eighteen or twenty inches of the water. Beyond the lake, a spacious vacuity, 220 feet in length, 200 feet broad, and, in some parts, 120 feet high, opens in the bosom of the rocks, but the absence of light precludes the spectator from seeing either the sides or roof of this great cavern. It is traversed by a path, consisting partly of steps cut in the sand, conducting from the first to the 'Second Water.' Through this travellers are generally carried on the backs of the guides. Near the termination of this passage, before arriving at the water, there is a projecting pile of rocks, popularly called 'Roger Rain's House,' on account of the incessant fall of water, which trickles down in small drops like rain through the crevices of the rocks. A little beyond this is a tremendous hollow called the 'Chancel.' At

this point the rocks appear broken and dislocated, and the sides and prominent parts of the cavity are incrustated with large masses of stalactite. In the 'Chancel,' the stranger is much surprised and impressed by hearing the death-like stillness of the place suddenly interrupted by a burst of vocal music from the upper regions of the cavern. The tones are wild and discordant, but heard in such a place, and under such circumstances, they produce a powerful impression. At the conclusion of the performance, the singers display their torches, and eight or ten women and children—the inhabitants of the huts at the entrance—appear, ranged in a hollow of the rock, about fifty or sixty feet from the ground, to which they gain access by clambering up a steep ascent which commences in the opening at the entrance of the hollow called the 'Chancel.' From the 'Chancel,' the path leads onward to the 'Devil's Cellar;' and thence a gradual but somewhat rapid descent of about 150 feet conducts to a spot called the 'Half-way House.' Neither of these places claim particular notice. Farther on, the way proceeds between three natural arches, pretty regularly formed, to another vast cavity which is denominated 'Great Tom of Lincoln,' from its resemblance to the form of a ball. A very pleasing effect is produced when this place is illuminated by a strong light. The arrangement of the rocks, the spiracles in the roof, and the flowing stream, unite to form a scene of no common interest. The distance from this spot to the termination of the entire hollow is not considerable. The vault gradually descends, the passage contracts, and at last nearly closes, leaving only sufficient room for the passage of the water, which appears to

have a communication with the distant mines of the Peak Forest." The entire length of this wonderful excavation is about 2250 feet from the surface of the mountain, and its depth is 620 feet. In general, the access to the cavern is easy, but in very wet weather it cannot be explored, as it is then filled with water, which rises to a considerable height, even at the entrance.

POOL'S HOLE.

POOL'S HOLE is a cavern about a mile from Buxton, the entrance to which is so low that for the first twenty five yards the visitor is unable to walk upright. "The fissure then widens into a spacious cavern, the roof of which displays spiral masses of stalactites, formed like icicles, by the dropping of water impregnated with calcareous matter. In other cases the water dropping on the floor constitutes masses of stalagmite, one of which, of great size, occurs nearly in the middle of the cavern, and is called the 'Flitch of Bacon.' The cavern is here narrow, but soon after again widens and continues to do so, until the visitor reaches a very large mass of stalactite called the 'Queen of Scots' Pillar,' tradition having recorded that Mary during her sojourn at Buxton advanced thus far into the cavern. Few strangers proceed beyond this point, as there is nothing sufficiently interesting to repay them for the trouble; and the cavern terminates at about 95 yards beyond the pillar above mentioned. The passage by which visitors return is for some distance under the road by which they enter; and here also various masses of stalactite occur, the forms of which are constantly undergoing transformation; and which are named from

some fancied resemblance which they once bore to particular objects." The cavern is said to derive its name from an outlaw named Pool, who made it his abode.

ELDON HOLE.

ELDON HOLE is a perpendicular cavern from sixty to eighty yards deep; the floor of which is about sixty-two yards deep nearest the mouth, but which shelves downwards.

BRADWELL CAVERN.

BRADWELL CAVERN between Castleton and Hope, is remarkable for the riches and beauty of its stalactites; from which it is sometimes called the crystallized cavern. As it is very easy of access, it is frequently visited, and its numerous grottoes have received the fanciful names of the "Music Chamber," the "Grotto of Paradise," the "Hall of State," &c. The Music Chamber is so called from the crystals which line its sides; and which take in one place so exactly the character of the pipes of an organ, that it is difficult to divest the mind of the idea of an organ of glass having been placed in the cave. The Grotto of Paradise appears studded with gems of various colours, particularly emeralds and rubies; and the Hall of State looks as if hung with gigantic chandeliers.

OTHER CAVERNS IN DERBYSHIRE.

THESE are numerous; but they contain little that is remarkable, except the Cumberland cavern, in which there is a grotto, "decorated with what is called the

snow fossil, a petrification, which, in figure and colour, closely resembles snow when drifted into the cavities of a rock."

DUDLEY CAVERNS.

AT Dudley there are caverns of two kinds, both of which abound in curious fossils, but both of which have been formed by the hand of man. They consist, in fact, of excavations which have been made in working the limestone; and these excavations in the dark caverns have not only been carried on entirely underground, but have led to the formation of a subterranean canal. What are called the light caverns are merely excavations open to the light of day, but with pillars left between to support the superincumbent surface. Both caverns, though formed artificially, are extremely curious and worthy of being explored, from the great quantity of fossils which they contain; and amongst others beautiful specimens of trilobites and stone lilies, some of which will be described in a subsequent part of this work.

CAVERNS IN OTHER PARTS OF ENGLAND.

THERE are numerous other caverns in different parts of England, but few of them contain anything remarkable, excepting *Kirkdale Cave* in Yorkshire, which is very interesting from the immense number of bones of elephants and hyænas found in it, together with those of the rhinoceros, and other animals which could not now live in a wild state in any part of Great Britain, and which are consequently supposed to be relics of the world before the Deluge. Okey Hole is a cavern about 200 yards long, on the south side of the Mendip Hills;

and Pen Park Hole is a cavern near Bristol, respecting which fearful tales were formerly told, which modern knowledge has dispelled. Streams of water run through both these caverns; as indeed is generally the case in all caverns of any magnitude.

SCOTCH CAVERNS.

THESE are less abundant than in England; as granite is the principal stone in the Scotch mountains; and the caverns which are found there, are generally only shallow openings in the side of a mountain. The most curious of the Scotch caverns are those formed by crystallization as at Staffa.

FINGAL'S CAVE.

FINGAL'S CAVE in Staffa, one of the western islands of Scotland, is generally considered the grandest natural cavern in the world. The island of Staffa is very small, being scarcely a mile in length from north to south, and about half that extent from east to west. It is, in fact, a mere mass of lava and basalt, the latter forming the beautiful crystallizations which give the chief attraction to the place. The whole island appears to be supported on a number of pillars, which in some places are so low as to be almost on a level with the surface of the water, but in others rise to the height of one hundred and fifty feet; and it is from these pillars that the island takes its name, as the word Staffa signifies staffs or columns. The highest part of the line of the pillars is at the southern end of the island,

and it is here that the celebrated natural excavation called Fingal's Cave is situated. It is a vast opening forty-two feet in width at the mouth, extending 227 feet in depth, and gradually diminishing from nearly 100 feet to about fifty feet in height, supported throughout on both sides by perpendicular columns of extraordinary regularity. "The opening is surmounted by a noble arch, and from this to the farther extremity of the cave, the roof extends in an unbroken surface, composed in some parts of smooth and unvariegated rock, in others of the ends of pillars stuck together in groups or bunches, with stalagmitic substances, which fill up the interstices, displaying a species of mosaic work of great regularity and beauty. On the west side the wall of pillars is thirty-six feet in height, but on the east, although the roof is of the same elevation, they spring from a much higher base, and are themselves only 18 feet high. Along this side is a narrow foot-path raised above the water, which covers the floor, along which it is possible for an expert climber to make his way to the farther end of the cave, although the attempt is rather hazardous. The proper and usual mode of viewing the cave, is by entering it in a boat, but even this can only be done with safety when the weather is tolerably calm. From the opening being so spacious, there is abundance of light to the extremity, and from the same cause, the waves, when there is a heavy sea, will come into it with great force. It is said, that there is, very far in the cave, a hole in the rock below the water, which makes a singularly agreeable sound on the flux and influx of the tide." The basaltic pillars of this cavern are of a greenish black hue, but between several of the pillars a yellowish lichen has

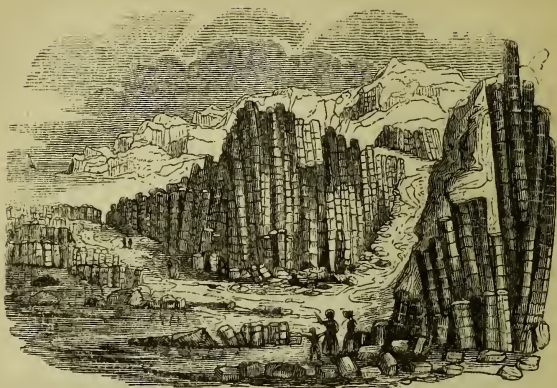
formed, which gives the contrast of two strongly defined colours through nearly the whole extent. In some places lichens of various shades are to be found; but the predominant colours are those which have been already mentioned.

IRISH CAVERNS.

THE principal of these is in Dunmow park near Kilkenny. It is sunk below the ground, and the opening to it is about 120 feet across, resembling a great pit or well, with trees and shrubs growing out of the sides. At the bottom of the pit the spar is of all shades, and very beautiful. There are knobs rising from the floor, and icicle-shaped cones hanging from the roof, so that the cave has been compared to the opened mouth of an enormous wild beast with teeth above and below. The cave has many turnings and windings, and as in the brook which runs through it, the bones of at least 100 human beings were once found, it is supposed that either in the time of the Civil War, or of some religious persecution, great numbers of persons took shelter in this dark hiding place, and there perished.

GIANT'S CAUSEWAY.

The *Giant's Causeway* in the county of Antrim in the north of Ireland, appears to have been formerly a cave like that of Staffa; and though it is now partly destroyed, a curious mass of basaltic rocks, consisting of many hundred thousand columns, still remains. These columns are formed of several joints,



GIANT'S CAUSEWAY.

fitting closely into each other like vertebræ, and, generally speaking, each having five sides. The principal mass extends nearly 600 feet into the sea, as far as can be seen at low-water mark; but it has been supposed to reach to the opposite coast of Scotland, as there are some rocks of a similar kind which can be traced into the sea. The breadth of the causeway is in general from twenty to thirty feet, but it varies very much. The highest columns are nearly 300 feet above the level of the water, but at their termination they appear to sink into the sea. The most curious circumstance relating to this range of rocks is, that each column is composed of several stones, which, as before observed, are curiously fitted one into the other so closely as to leave no cavity between; each stone having one surface convex and the other concave; so that the projection on the one

fits exactly the concavity of the other. Generally, the convex portion of the stone is upwards, so that the stone above it can only be displaced by raising it. The length of the stones between the joints differs, but in general each stone is from eighteen inches to two feet long.

There are basaltic columns similar to those of the Giant's Causeway in several of the mountainous parts of South America, one of which is figured by Humboldt. There are also columns of the same nature in India, and in various parts of Europe.

CAVERNS FOUND ON THE CONTINENT OF EUROPE.

THESE are so exceedingly numerous, particularly in the Tyrolese Alps, that it is quite impossible to give more than a slight idea of the most remarkable.

THE GROTTA OF ADELSBERG.

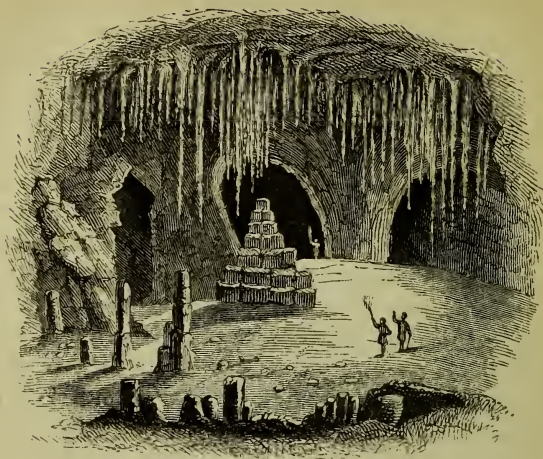
THE cavern at Adelsberg is situated about half way between Laybach and Trieste, and the entrance to it is in the midst of most romantic scenery. The following account is abridged from a description given of the cavern by a visitor to it. The entrance is secured by a door, after passing which, the traveller proceeds through a gallery about a hundred paces long, which opens into a large and very lofty cavern. Beyond this, however, is one much larger, which forms a splendid hall fifty feet broad, seventy feet long, and of an enormous height. As this is the hall in which the neighbouring peasants celebrate

annually the festival of their patron saint, the floor is made quite level, and there are a few wooden benches, and rustic chandeliers. These, however, appear paltry compared with the surpassing beauty of the stalactites with which nature has decorated the walls of the cavern. From this great hall, smaller caverns branch off in different directions; those to the left are numerous, spacious, and lofty; while the others, though smaller, are more varied and fantastic in their form. They reach an enormous distance, and about two leagues from the entrance there is a deep subterranean lake. It is impossible for any language to describe the magnificence and beauty of the stalactites in these caverns. In almost every part, long shining spars hang down like enormous icicles of dazzling brilliancy, and reflect the rays of light from the torches so as to look as if set with a thousand brilliant gems. In one place, the visitor appears to wander through the aisles of a Gothic cathedral, supported by columns of gigantic height, sometimes single, and sometimes clustered together as if fluted. In other places there are crystal cascades of the most dazzling brightness, one of which takes the form of folds of drapery, rows of pillars ornamented with festoons, triumphal arches, and a kind of throne surmounted by a coronet. Indeed, to use the words of Sir Humphrey Davy, the whole scene looks like one produced by enchantment; and can "only be compared to a scenic representation of a temple or banquet hall for fairies or genii, such as those fabled in the Arabian romances." Some idea of the general appearance of the grotto may be formed from the model exhibited at the Colosseum in London; but the extreme beauty of the

stalactites, and the effect produced by their whiteness or brilliancy contrasting with the dark masses of rock around them, can scarcely be conceived by any one who has not seen the original. To add to the grandeur of the cavern, a dark river rushes through it, roaring tremendously in the abyss beneath, and making its way over the rocky ridges which are interposed in its course with a strange crashing noise, which has an indescribably awful effect when reverberated through the cavern. In one place the guides set fire to a bundle of straw, which they throw into a small dark lake in the deepest part of the abyss, into which the river is seen rushing, and which enables the stranger to form a much better idea of the fearful grandeur of the scene.

OTHER EUROPEAN CAVERNS.

THE most remarkable of these is the *Grotto of Antiparos*, in the island of the same name in the Grecian Archipelago. The passage to this grotto is through a large arch on the side of a rock; and the traveller soon finds himself in a low narrow alley, the sides and roof of which are covered with most beautiful crystals, which, of course, glitter in the torch-light, like various kinds of precious stones. At the end of this passage is a steep precipice, down which the visitor is lowered by a rope being tied round his waist. At the bottom of the first precipice is a level space, which extends only a short distance, when the traveller arrives at another precipice, down which he is lowered in the same manner as he was down the first, and at the bottom of this second precipice is a grotto of



GROTTO OF ANTIPAROS.

extreme beauty, though not of very great extent. It is, in fact, about 120 feet long, nine feet high, and seven feet wide. This passage leads to another precipice, which is descended by means of a ladder, and this leads to the grotto, which is upwards of 300 feet in length and breadth, and nearly 200 feet high. The whole of the grotto, roof, floor, and sides, is entirely covered with a dazzling incrustation as white as snow. Columns, some of which are twenty-five feet in length, hang like enormous icicles from the roof, and others rise from the floor, looking like petrified trees; while, as may easily be supposed, these beautiful stalactites when seen by the light of torches, look like a thousand dazzling gems. But, perhaps, the most wonderful circumstance belonging to this grotto is the example it

affords of the courage and perseverance of man; for it certainly required no little courage and perseverance to descend three precipices to the depth of 1500 feet below the surface, which it was necessary to do to discover the most magnificent of the caverns.

Another interesting grotto is *St. Michael's Cave* in the rock of Gibraltar, 1000 feet above the level of the sea.

The grottoes in the Cevennes mountains in France are numerous and extensive, and abound in objects of curiosity.

In the volcanic country near Rome, there are many grottoes of considerable extent, which are occasionally resorted to as places of refuge from the heat.

The *Grotto del Cane* near Naples is chiefly celebrated for a noxious vapour which rises about two feet from the ground, and which consequently kills a dog or any creature whose head is about that height from the ground, but which does no injury to a man, whose head is so much higher.

The *Grotto of Fredericshall*, in Norway, is calculated to be 1,100 feet in depth, but it does not appear that its caverns have been fully explored.

AFRICAN CAVERNS.

THE *Cavern of the Blink or Shining Mountain*, near Lattakoo, in Southern Africa, is very curious, from the kind of rock in which it is situated, which contains a vein of galena, or lead-glance. A description of it has been given by Mr. Campbell, a missionary, who informs us that Lattakoo is frequently visited by

the Hottentots from all parts of the neighbouring country, "to obtain a bluish powder which the mountain furnishes, and which the natives use for sprinkling among their hair; it having been the fashion from time immemorial in this country, for the natives to use a hair powder of this peculiar colour. The powder is the dust which crumbles from the galena, and it looks exactly like the black lead with which grates are cleaned in England. Another part of this low, flat-topped hill, produces a species of red chalk or stone, with which some of the surrounding nations paint their bodies." Mr. Campbell adds, that when he visited the mountain, it appeared to him "to consist of a number of dark brown rocks, which had been produced by some volcanic eruption;" and that when he and his companions descended into the cavern with torches, and penetrated above 100 feet into the interior of the mountain, the dust flew about so abundantly, that it almost extinguished their lights. "The roof was arched and studded with projecting pieces of the shining rock, between which there seemed something closely wedged in, and which, as the explorers of the cavern looked up, appeared exactly like carved work. Putting up the lights, however, close to the part, to satisfy their curiosity more fully, they found that the supposed carved work was nothing but myriads of sleeping bats; which, crowded together in a dormant state, adhered to the roof by the claws of their hinder legs. These bats could not be roused otherwise than by putting the torches close up to them; upon which some of them, letting go their hold, flew off to another part of the cavern. When the travellers left this gloomy place, and again emerged into daylight, they were almost as

black as chimney-sweeps, from the dark powder that adhered to them."

AMERICAN CAVERNS.

ONE of the most remarkable caverns of North America, is the *Mammoth Cave of Kentucky*, which is said to extend eight or ten miles underground, with numerous windings and avenues. Six miles from the entrance, is an immense cavern, eight acres in extent, without a single pillar to support the roof, which is 100 feet high. The whole of the earth in this cavern is strongly impregnated with nitre, and works have been established for purifying it.

There are many other caverns in Kentucky and Tennessee, some of which have been used as burial places.

Madison's Cave in Rockingham County, Virginia, is not very extensive, but it is remarkable for its beautiful incrustations and stalactites.

Wier's Cave, in the same county, extends 2,400 feet underground, but it is very irregular in its shape and size.

In the north-west of Georgia is a cave fifty feet high, and about 100 feet wide. In this cavern is a subterranean cascade formed by a stream of considerable size which runs through it; and near Corydon, in Indiana, is a cave which has been explored for a distance of several miles, and which is celebrated for producing what are called in England Epsom Salts.

In South America is the *Cavern of Guacharo*, which is said to extend underground for many leagues.

LIMESTONE CAVERNS IN NEW ZEALAND.

IN Angas's *Savage Life and Scenes in Australia and New Zealand*, there is a very curious account of some limestone caverns in New Zealand. They are situated on the side of a lofty hill in the volcanic region of Wanganui, and when Mr. Angas and his party explored them, they took with them torches made from the light and inflammable bark of a tree. "A large fuchsia grew at the opening of the cavern, which was evidently an occasional place of shelter with the natives. The entrance to the largest cave is a spacious arch in the side of a perpendicular wall of limestone rock. For about sixty feet the cave runs inwards, forming one grand and lofty antechamber, hung with stupendous masses of stalactite; the stalagmitic incrustations on the floor assuming the forms of huge mushrooms, tables, pillars, and frequently joining with the stalactites from above, producing columns of a picturesque appearance. At the inner extremity of this vaulted chamber is a deep descent, nearly dark, at the bottom of which a rapid subterranean stream flows across the cave; and beyond this river the cavern was supposed by the natives to terminate." Mr. Angas crossed this river, and after managing to climb up the almost perpendicular bank opposite, he reached the entrance of a gallery about twenty feet above the water, which was just large enough to admit four persons crawling in on their hands and knees. Dangerous as the passage appeared, Mr. Angas and his companion resolved to explore it. "After crawling along a corridor of sparkling stalactites for about thirty feet, forcing our bodies between huge

pillars of stone, we suddenly entered a spacious chamber of indescribable loveliness; it appeared as though gnomes and fairies had been at work to adorn this magic hall. The roof, hung with stalactites of the most exquisite and pearly whiteness, was supported by columns of yellow and transparent spar, that gave it the resemblance of a natural temple; and the crystalline walls and floor were covered with a sort of fluorine bloom of the most delicate hue and texture. Ours were the first human eyes that beheld this resplendent saloon hid in the bowels of the earth; it was evident that no one had ever entered this fairy abode, for our footsteps destroyed the bloom on the floor, and not the slightest mark of intrusion was anywhere discernible. We felt it to be almost an act of desecration to intrude on this secret and glorious chamber, whose chaste splendour shone forth in the unsullied purity of its pristine beauty. The scene seemed to realise Coleridge's poetic description in his 'Kubla Khan,' of 'that sunny pleasure-dome, with caves of ice'—

‘Where Alph the sacred river ran,
‘Neath caverns measureless by man,
Down to a sunless sea.’”

CHAPTER V.

PLAINS AND DESERTS.

VAST Plains are the very opposite of ranges of mountains, and thus when we find any country partially covered with an extensive mountain range, we generally find in the same country vast plains, or, perhaps, deserts, placed near the mountains, as if to afford a natural counterpoise. Thus the plains of Lombardy are found near the Alps, the Llanos, and the Pampas of South America, are in the immediate vicinity of the Andes, and the Sahara, or Great Desert of Africa, extends to the foot of Mount Atlas.

THE PAMPAS.

THE word Pampas signifies treeless plains, and it is applied to the vast tracts of level country which extend for about two thousand miles from north to south, forming a belt or band across nearly the whole Continent of South America, the band varying in breadth from 300 to 450 miles. One can easily imagine the extraordinary effect these immense ocean-like tracts produce upon a stranger, particularly as they are partially covered with a kind of coarse grass, six feet high, which waves in the wind, and gives that resemblance to the waves of the sea which has so often been noticed

by travellers in this country. In some places, extensive portions of these plains are overgrown by thistles, six or eight feet high, which are used as fuel, as the country is entirely devoid of trees and shrubs, excepting a few plantations of peach-trees, which have been formed near the huts of the inhabitants, but which seldom rise above the thistles. The huts are of the most simple description, and being very low, and covered with bull-rushes or grass, they do not catch the eye. As there are occasionally slight depressions in the surface, in which water lodges during the rainy season, the grass is never burnt up, and, consequently, immense herds of cattle and horses are enabled to live upon these plains, which the inhabitants catch with the greatest adroitness by means of a leather thong, called a lasso. This thong has a slip-noose at one end which the Guachos throw with the greatest adroitness over the head of any animal they wish to entrap. These men almost live on horse-back, and they sit their horses so easily and so gracefully, and have them so perfectly under command, that they seem almost to realise the fables of the Centaurs. At the northern extremity of the Pampas is a tract of land called *Las Salinas*, or the Salt Deserts, and the following description of them is extracted from the account given to us by the only traveller who is known to have visited them. "The morning was ushered in by a cloudy mist, through which the red sun gradually rose, partially dispersing the upper vapours, while others appeared to resist his influence, and, attracted to the earth, remained dense and motionless near its surface. As we entered the Salinas the scene became novel and striking. The wide plain, level and smooth as a floor, and snow-white with superficial salt, stretching its treeless and

shrubless waste on all sides to the horizon, unbroken by any object, save a few stunted, straggling, and leafless alkaline bushes, the black and crooked branches of which, contrasting with the whiteness of the soil, were here and there hid and intersected by a broad, compact, and very thin stratum of mist, whose under surface was slightly elevated from the soil, while its upper was below the tops of the bushes, thus permitting only their stems and tops to be recognised. This was the *mirage*. Over head rolled thick and broad masses of transparent white vapour, which, except at intervals, hid the sun without greatly intercepting his light; and when his rays shot between these masses, they were reflected from the space on which they fell by the saline superficies of the soil with a dazzling effulgence. Such was the appearance of the vast salt plains at the time we crossed them, in the middle of April. Great changes, however, are produced by a variation of circumstances. I have myself observed the most astonishing change in the appearance of a portion of the plain after sudden rain succeeded by a hot sun. In a region where a slight saline efflorescence is ordinarily seen, the ground became almost snow-white from the rapid crystallization of saline matter, and reflecting the rays of a fierce sun, rendered it most difficult to keep the sight fixed on the road track. The landscape appeared in one blaze of reflected light, trees and shrubs seemed on fire, and the whole scene might have been taken for the land of the genii; while the hot north wind, called the *souda*, rose by degrees, and in squalls to a gale, with a close heat like that of a furnace. In this instance nothing in the shape of a cloud or mist was present." These salt plains are entirely devoid of

grass, and as there is great scarcity of water, and scarcely any rain, they are deserts of the worst description, and when the hot wind before mentioned blows, they are scarcely passable. This wind blisters the skin on the face and hands, and the leaves not only fall scorched from the trees, but the bark becomes hot and shrivelled, just as if fire had been applied. The Salinas extend about 200 miles from east to west, and about 140 miles from north to south; so that they occupy a tract of land almost as extensive as Ireland.

THE LLANOS.

THE Llanos are only about half as extensive as the Pampas, but even they cover an area of country equal to twice the extent of France. The Llanos are situated on the left banks of the Orinoco, and towards the mouth of that river they are wooded. Another portion is called the Llanos Altos or the elevated plains, and these extend about 350 miles from east to west, and 200 from north to south. They are not fertile, as they consist of a dry chalky soil, but they are more healthy than the low ground, and they extend to the foot of the Andes. The greatest disadvantage they possess, however, is the want of water, which the traveller is generally obliged to carry with him. The greater part of the Llanos, however, lie low, and are covered with the most abundant vegetation as soon as the rainy season has commenced. The Llanos are situated entirely within the tropics, and are subject to alternate seasons of rain and excessive drought.

THE SELVA.

THE Selva is another of the vast plains which form so distinguishing a feature in the aspect of South America; but, unlike the other plains, it is entirely covered with wood. It extends from the north of the river Amazon westward to the base of the rocky masses of the Andes, and in this direction it measures at least 1500 miles; its width varies from three to eight hundred, or perhaps more; and its surface probably comprehends an area equal to six times the extent of France. A great portion of this vast plain is occasionally inundated with the waters of the Amazon, and the other vast rivers that traverse it; and, indeed, it is generally calculated that 200,000 square miles are annually laid under water. "The whole of this low region is covered with an exceedingly thick wood. It is composed of large trees of various sizes and heights, and what is very remarkable, they differ greatly in species; so that no two trees standing together are of the same kind. On a space of twenty square yards perhaps thirty or forty trees are found, but all are of different species. The spaces between them are filled up with grass-trees, and bushes of different kinds and sizes, standing close together, and the whole is united into one mass by numerous climbing plants and creepers, which, as it were, constitute the web of the tissue. Thus a woody fabric is raised, as impenetrable to man as a wall of stone, and more difficult to be removed; near the ground only is found here and there a small and low opening, by which the jaguars and other wild beasts find access

to the beds of the rivers. These woods can only be entered where they are traversed by water-courses deep enough to be navigated by canoes, but such attempts are usually very laborious. The branches of the trees overhang the channels from each bank, and as they are also entwined by climbing plants, the progress of the canoe can only be effected by cutting the branches. The larger rivers afford a more open and free access, but at many places similar obstacles occur in them." At a considerable distance from the banks of the Amazon there are occasionally savannahs or grassy plains; but the greater part of the Selva is covered with wood so thickly as to render its cultivation almost impracticable. Some of the climbing plants which hang from the trees are Orchidaceæ of the most singular forms and brilliant colours; and the birds and butterflies which flutter about are of such dazzling brilliancy in their colours, as to be almost painful to the eye. There are, however, numerous poisonous serpents and stinging insects among these thick woods; and their inhabitants are almost of the lowest order of human beings.

THE PUNA OR DESPOBLADO OF THE ANDES.

IN many parts of the Andes are extensive tracts of table land at the height of about 12,000 feet above the level of the sea. They are called in the language of the country *Puna*, but the Spaniards give them the name of Despoblado, or the uninhabited country. "These table lands form the upper mountain regions of the South American Highlands: they spread over the whole extent of Peru, from north-west to

south-east, a distance of 350 Spanish miles, continuing through Bolivia, and gradually running eastward into the Argentine Republic." The climate of these regions, Tschudi tells us, is not less rigorous than that of the high mountain ridges. Cold winds from the west and south-west blow nearly all the year round from the snow-covered Cordillera; and for the space of four months, these winds are daily accompanied by thunder, lightning, and snow storms. The piercing cold felt during the night is succeeded by a burning heat during the day, and a return of the same cold at night; and the transition is the more sensibly felt on the fall of the temperature, as it is usually accompanied by sharp biting winds, so keen, that they cut the skin on the face and hands. It is no uncommon circumstance for the excessive cold of these regions to cause death; and the bodies of travellers who have perished in the cold are frequently met with, the bodies shewing no symptom of decay, but the faces having a horrid appearance of laughter, from the contraction of the muscles at the period of dissolution. This remarkable appearance is the effect of the Puna wind, which has the power of speedily drying animal bodies, and thus preventing putrefaction. "A dead mule is, in a few days, converted into a mummy; not even the entrails presenting the least trace of decomposition. It frequently happens that, after being long exposed to these cold winds, the traveller enters warm atmospheric currents. These warm streams are sometimes only two or three paces, and at other times, several hundred feet broad. They run in a parallel direction with each other, and one may pass through five or six of them in the course of a few hours." Tschudi observes, that it appears that

these currents are not merely temporary, for the mule drivers can often foretell, with tolerable accuracy, where they will be encountered. "The aspect of the Puna," he adds, "is singularly monotonous and dreary; the expansive levels are scantily covered with grasses of a yellowish brown hue, and are never enlivened by any fresh looking verdure; and they have only here and there a few stunted trees and shrubs. In these elevated regions, the effect of the diminished atmospheric pressure on the human frame, shews itself in symptoms of intolerable weariness and an extreme difficulty of breathing. The natives call this malady the Puna, but the Spanish Creoles give it the names of *Mareo* and *Veta*. Ignorant of its real causes they ascribe it to the exhalations of metals, especially antimony, which is extensively used in the mining operations; the first symptoms of the veta are usually felt at the elevation of 12,600 feet above the sea. These symptoms are vertigo, dimness of sight and hearing, pains in the head and nausea. Blood flows from the eyes, nose, and lips. Fainting fits, spitting of blood, and other dangerous symptoms usually attend severe attacks of veta. The sensations which accompany this malady somewhat resemble those of sea-sickness, and hence its Spanish name *mareo*. But sea-sickness is unaccompanied by the distressing difficulty of breathing experienced in the veta." This disease frequently proves fatal to human beings, and cats are generally destroyed by it. In fact, at an elevation of 13,000 feet above the level of the sea these animals cannot live. "Numerous trials," Tschudi informs us, "have been made to rear them in the villages of the upper mountains, but without effect; for, after a

few days' abode in those regions, the animals die in frightful convulsions; but when in this state they do not attempt to bite."

THE PRAIRIES.

THE Prairies of North America are nearly as extensive as those of the south, and they are much more beautiful, as they present extraordinary richness of vegetation, combined with an undulating surface, which rises and falls like the swelling of the ocean, while in various places it is diversified by bluffs or round hills, which are generally covered with grass and flowers to the very top. On the outskirts of these Prairies a zone about 200 miles in breadth is covered with wood, containing oaks with leaves of various shapes, most of which turn of a brilliant red in autumn; magnolias with their large white flowers, which are of oppressive sweetness; and various kinds of rhododendrons and azaleas. The swampy grounds near the rivers are covered with enormous trees of the deciduous cypress, and the white cedar; and these dreary solitudes are called the cypress swamps.

The Prairies being covered with grass for hundreds of miles, it is impossible either to cut it or to graze it all, and, consequently, in the autumn it withers and becomes perfectly dry. In this state it frequently takes fire, either by lightning or other accident, or it is set on fire by the Indians, who wish to burn off the long grass, in order to ensure a fresh crop for their horses, and also to render their travelling more agreeable. "Over the higher grounds and prairie bluffs, where the grass is short, the flames creep



PRAIRIE ON FIRE.

slowly and feebly, and the animals remain quiet till they approach them, when they bound over the fire, and escaping further molestation, trot off amongst the ashes. These scenes at night become indescribably beautiful, when the flames are seen at many miles' distance creeping over the sides and tops of the bluffs; and the hills being invisible, the flames appear sparkling and brilliant chains of liquid fire, hanging suspended in festoons from the sky." But in some cases, the scene is altered from the interesting and beautiful, to the majestic but terrific. "In many parts, the grass is six or seven feet high, as in the Missouri bottoms, and the flames are driven forward by the hurricanes, which often sweep over these vast prairies. There are many tracts like this on the Platte, and the Arkansas, of many miles in breadth,

which are perfectly level, with a waving grass, so high, that men are obliged to stand erect in their stirrups, in order to look over the waving tops, as they are riding through them. The fire in these places, before such a wind, travels at such an immense and frightful rapidity, as frequently to destroy parties of Indians who may be overtaken by it: not that it travels so fast as a horse at full speed, but the high grass is entangled with wild pea-vines, and other plants of the kind, which impede the rider, and compel him to guide his horse in the zig-zag paths of the buffaloes and deer, and retard his progress so much that he is often overtaken by the immense cloud of smoke and flame; which, with its thundering sound and lightning glare, destroys almost everything that it approaches."

The Prairies contain immense herds of buffaloes, which are found by tens of thousands. There are also abundance of antelopes, and some few wolves. The most remarkable animal found in Prairies, however, is what is called the Prairie dog, but which is said to be a kind of marmot. These curious creatures inhabit what may be called subterranean villages, with curious little conical hills on the surface of the ground, near which are the openings to the subterranean passages in which they dwell; and they may often be seen sitting beside the hills, though the moment a stranger appears, they scamper away and burrow in the ground like rabbits in a warren.

THE SAHARA.

THIS is a vast sandy desert, which occupies the central parts of northern Africa. It extends from east to west not less than 2650 miles, and from north to south it varies from 700 to 1200 miles; and this immense region perhaps enjoys a smaller share of the gifts of nature than any other known portion of the globe. Even the Lybian desert, which is considered superior to the Sahee, is strongly impressed with all the characteristics of sterility. Its surface is formed of a hard sandstone rock, as "smooth and level as a bowling green, not exhibiting the least furrow or depression of the surface for hundreds of miles. Nothing is to be seen but the hard pavement under foot, and the cloudless sky overhead. At last the scene changes. The sandstone is succeeded by gravel, frequently interspersed with rounded pebbles. The surface continues to be flat, but is frequently furrowed by ravines and glens, sinking sometimes to thirty feet below the general level, and in these depressions a few bushes are met with. Round these bushes the finer sand, brought by the easterly winds, frequently collects, so as to form small sand-hills." Some portions of these gravelly plains are covered with incrustations of salt, which look like ice; and in others there are whole rows of sand-hills, which look like miniature ranges of mountains. The other portion of the great desert is nearly all sand, the sand being occasionally raised into hills, which are moveable, and rise and fall in the wind like the waves of the sea. Sometimes when a mighty wind arises, the violent gales raise up "the loose sand in such quantities

that a layer of nearly equal portions of sand and air, and rising about twenty feet above the surface of the ground, divides the purer atmosphere from the solid earth. This sand, when agitated by whirlwinds, sometimes buries whole caravans, and frequently puts them into the greatest confusion." "One of the largest of these pillars of sand," says Caillié, "crossed our camp, upset all the seats, and whirling us about like straws, threw one of us on the other in the utmost confusion. We knew not where we were, and could not distinguish anything at the distance of a foot. The sand wrapped us in darkness like a fog, and the sky and the earth seemed confounded and blended in one. Whilst this frightful tempest lasted we remained stretched on the ground motionless, dying of thirst, burned by the heat of the sand, and buffeted by the wind. We suffered nothing, however, from the sun, whose disk, almost concealed by the clouds of sand, appeared dim and deprived of its rays." There are but few wild beasts in the desert: lions and panthers are met with occasionally, as are gazelles and antelopes; but the only living creatures that are common in the desert are ostriches, which are seen scudding by with almost as much rapidity as the whirlwinds. No other birds are seen except vultures and ravens. It is only along the boundaries that trees are occasionally found, and they are principally acacias or mimosas of different kinds, which almost all produce abundantly what is called gum arabic. It would be impossible to cross the deserts if it were not for the camels, as no other beast of burthen could possibly endure the heat, the fatigue, and the want of water. One of the pecu-

liarities of the Sahara is that there is occasionally found in it a little spot of fertile soil called an *oasis*, where trees and grass grow with the greatest luxuriance. These little spots are always where there happens to be a spring, as the desolation of the desert is principally produced by its excessive dryness. Throughout the greater parts of the desert, no water is to be procured, and consequently there is no oasis; but on the eastern side, these spots are more abundant, and, indeed, the whole kingdom of Fezzan, which is nearly surrounded by the desert, may almost be regarded as one vast oasis. It is probable that the beauty of these little fertile places may have been exaggerated, as we can easily conceive the rapture with which shady trees and fresh grass must be hailed by a traveller who has been passing several days over burning sands.

THE DESERTS OF SOUTH AFRICA.

THE principal of these is the desert called the *Great Karoo*; Karoo in the Hottentot language signifying dry or arid. The Cape territory consists of three successive ranges of mountains running parallel to each other, and the space enclosed between the last two of these is the desert in question. It consists of a vast plain, 300 miles in length, and nearly 100 in breadth, the soil of which is of such a hard impenetrable nature as to bear scarcely any trace of vegetation.

It is supposed that there are numerous other tracts of arid clay in the interior of South Africa, as the

natives, when describing the interior of the country to the settlers, frequently mentioned the word Karoo; but they have not as yet been explored by human beings.

THE DESERTS OF ASIA.

THE principal of these are in Tartary, that is, the highlands of central Asia, where there are extensive arid plains, and occasionally, for the space of a thousand miles, great deserts of loose sand, which, being carried about by the winds, is raised aloft in drifting clouds, as in the great desert of Africa. To the north of the Altai Mountains the country subsides into the low ground of Siberia, which, with occasional ranges of hills, extends in one vast plain to the Arctic Sea. These *steppes*, as they are generally called, are usually barren, but some of them are covered with deep forests, and others abound in rock salt and salt lakes, very few portions being fitted for agriculture or pasturage. "They are of the most dreary aspect, and as they advance into the northern latitudes, they combine the double evil of a barren soil and a severe climate."

There are many other deserts in Asia, but none of any great consequence except the *Deserts of Arabia*.

Arabia may be described as a vast collection of rocky and precipitous mountains, encircled by a border of low, barren, and sandy plains. From the sea-coast these plains extend from 100 to 200 miles into the interior as far as the hills. On the north the deserts extend from the hills to Syria, over Arabia Petræa or Stony Arabia; and on the south they reach as far as the mountains which overlook the Indian Ocean. "The

great characteristic of those vast tracts of desert, which frequently extend on a dead level for several hundred miles, is aridity, and its necessary consequence barrenness. They consist either of bare rocks or of hard or loose sand, and are almost destitute of fresh water. There is no eminence to arrest the clouds as they sweep along the sky, and whole years frequently pass away without rain. The drought is consequently extreme; vegetation withers under the fierce influence of a scorching sun; and the burning sands, reflecting the solar rays, occasion such intense heat as is not felt even in countries that lie directly under the equator. There are no rivers, the mountain torrents being speedily imbibed by the sandy soil; and the scanty supplies afforded by deep wells and springs, scattered at distant intervals, are the sole dependence of the fainting traveller for refreshment, and frequently for life. Without this resource these deserts must have for ever remained impervious to man. The aspect of desolation is sometimes relieved by verdant spots, which appear like islands on the trackless ocean; and some rare and hardy plants, such as the tamarind and the acacia, which strike their roots into the clefts of the rocks, find here a congenial soil, and flourish amid the surrounding waste." In the Arabian plains the thermometer is generally above 100° during the night; and this excessive sultriness renders the whole atmosphere almost insupportable, particularly as refreshing breezes are rarely felt, no change of temperature occurring to set the winds in motion; and dead calms occur, which sometimes continue for sixty days without interruption. Even when the winds resume their activity, this country is seldom visited by any but the

simoom or hot blast of the desert, under the withering influence of which all nature seems to languish. It is said, indeed, to have the quality of extracting from whatever it touches every trace of moisture; and it produces, when inhaled by either men or animals, a painful feeling of suffocation. When the camels feel it approaching, they lie down and bury their noses in the sand, to save themselves from its destructive effect; and the travellers, also, who meet it, throw themselves on their faces until it has passed. The approach of the simoom is indicated by an unusual redness in the sky, which, during the prevalence of the wind, seems to be all on fire.

The wells which are found sprinkled throughout the Deserts of Arabia are of great antiquity, and generally from twenty-five to thirty fathoms deep. They are lined with stone, and are believed by the inhabitants to be the work of a primæval race of giants.

DESERTS OF AUSTRALIA.

THESE are comparatively little known, but as it has been ascertained that the greater part of the interior of New Holland is flat and almost destitute of water, it is most probable that it contains vast sandy deserts: and, in fact, every attempt that has been hitherto made to explore the interior of the country confirms the idea of its desolation.

Near the central mountains are extensive plains which have been partially cultivated; though they are rendered almost uninhabitable by the frequent seasons of drought to which they are exposed.

PLAINS OF EUROPE.

THERE are no tracts of land in Europe which deserve the name of desert, though there are some which cover a vast extent of country without any hills.

The most extensive of these tracts are the *Steppes of Russia*, which extend almost from the Baltic Sea to the Black Sea, with scarcely any undulations of surface.

The large plain in the north of Germany, which lies at the foot of the Hartz Mountains, is another extensive tract of level ground, but it is highly cultivated.

Nearly one half of France is flat; and one portion of it is occupied with the vast sandy plains called the *Landes*, which are extensive tracts of sandy deserts producing nothing but broom, heath, and juniper. The most extensive are the *Landes* of Bordeaux, which are about sixty miles long and forty broad. On these plains some sheep are kept, and the shepherds belonging to them, whether walking or at rest, live, during the day, entirely upon stilts. It is said that this extraordinary custom, which raises their feet three or four feet from the ground, was adopted to enable them to see their sheep, which, from the scantiness of the herbage, frequently wander very far apart; and other reasons no doubt, are, the facilities which the stilts afford for passing over a great extent of country, which is frequently marshy, in an incredibly short space of time. Each peasant always carries a long stick, which serves as a third leg, and enables him, when he stops, to support himself without fatigue. The singular effect produced by these peasants, when seen for the first time, particularly if it

chances to be by an imperfect light, is the most extraordinary that can possibly be imagined, as they look like mighty giants rushing through the country with a supernatural speed.



PEASANTS OF THE LANDES.

In England there are some extensive plains, such as the *Downs in Sussex*, *Salisbury Plain*, the *Fens of Lincolnshire*, the *Downs of Devonshire*, *Dartmoor*, and some others. *Salisbury Plain* is the largest, as it extends twenty-two miles from east to west, and fifteen from north to south.

In Scotland the most extensive plains are the *Moors of Galloway* and those of the Highlands.

In Ireland there is a considerable quantity of bog-land, all of which is flat and uncultivated.

CHAPTER VI.

MINES AND FOSSILS.

MINES.

IN many places are found cracks or fissures in the solid rock, which are filled up with some kind of metal, and these are called mineral veins. As these veins are generally sunk deeply in the earth, it is necessary to dig to a great depth to obtain the metal from them, and to erect engines to make passages by which the metal is conveyed to the surface of the earth. This is called sinking and working a mine.

GOLD AND SILVER MINES.

GOLD is one of the scarcest of all metals; and though it is found in a great many different places, it is always in very small quantities, and it is either scattered in the sand of rivers in small globules, or compressed into slender veins in rocks of granite or some other very hard kind of stone. Sometimes, however, it exists in a mineralised state, mingled with various kinds of earth or stone. "In this state it would not be recognised to be gold by an inexperienced person; for it is red, white, or black, as it may happen, and shews none of its brilliancy or metallic character." When gold is found in this state, the ore is broken into pieces in a mill, and a quantity of

quicksilver is added to the mass, which, having a strong attraction for gold, draws every portion of it from the earthy matters with which it is mixed. The gold is afterwards separated from the quicksilver by the action of fire, by which the quicksilver is driven off, and the gold left pure.

When gold is found mixed with sand, the sand is carried to what in Mexico are called lavaderos, or washing places. Here it is kept continually stirred with iron hooks and rakes, while water rushing in, carries away the earthy matter; and the gold, from its weight, falls to the bottom. If the gold is not entirely freed from the sand by this process, it is put into a shallow dish, deepest in the middle, and filled up with water. With their spread fingers the workmen then whirl the whole round and round; so that the water and sand may pass over the edges of the dish, and the pure grains of gold remain in the central hollow.

Silver veins are more abundant, and as the silver is frequently found in limestone, it is not so difficult to work. There are numerous silver mines in different parts of Europe, particularly in Hungary, Bohemia, Sweden, and Norway. Those in Hungary are celebrated not only for their richness, but for the immense extent to which their operations have been carried on. "There are three principal veins, the course of which is nearly from north to south, and which run parallel to the River Gran, following even the windings of its channel. The dip or inclination of these veins is generally from west to east; and the largest of them is called the *Spitaler vein*. The second great vein at Schemnitz contains lead ore mixed with the silver. A third great vein is more

irregular in its formation than the two others, sometimes rising vertically and sometimes dipping in a contrary direction from east to west." The ores afford occasionally a considerable proportion of gold. These mines appear to have been wrought from a very early period, and the mining operations have been carried to a vast extent. The gallery or level, called the Emperor Francis's gallery, is a channel by which the whole of these mines are drained and cleared of water; it is carried through hard rock, and must have been a work of immense labour and difficulty, being about five English miles in length. This gallery was begun in 1748, and finished in 1765.

The largest silver mines in South America are at Potosi. They are said to have been discovered by an Indian named Hualpa, who, climbing up the side of a mountain in pursuit of a wild animal, caught hold of the stem of a tree to aid him in his ascent. His weight, however, was so great, or rather the tree was so slightly attached to the ground, that it gave way, and he found that he had torn it up by the roots. The animal, of course, escaped; but the hunter was consoled for his disappointment by finding some grains of native silver sticking to the roots of the tree. This led to a further examination, and a rich vein of silver was discovered, which had, in this place, reached nearly to the surface of the ground. The mine is in a mountain by itself, though it is situated high up in the Andes; and the peak enclosing the mine is about eighteen miles in circumference at the base, rising in the shape of a sugar-loaf. The silver lies so near the surface, that it has not been found necessary to sink a mine in the usual

manner, as the miners get as much silver as they require by merely scooping out the surface of the hill. In this way they have formed several hundred pits, none of which are above seventy yards in depth.

QUICKSILVER MINES.

THE most ancient quicksilver mines in the world are those of Almaden in Spain, which, according to Pliny, were worked 500 years before the commencement of the Christian era. The next most celebrated quicksilver mines are those of Idria in Carniola, about eight leagues from Trieste. The town of Idria, which gives its name to the mountains, stands in a deep valley, surrounded by lofty mountains, which exhibit a mass of dark-coloured slate included between two beds of limestone. The ores, consisting of native mercury and cinnabar, are deposited in this bed of slate, which is sixty feet thick, and of a very considerable extent. The following description of the mines of Idria is extracted from *Silliman's Journal*, and was communicated to that work by an officer in the American navy, who had made a pedestrian tour through Germany. "These mines have nothing corresponding with the ideas of terror which we are apt to connect with such places, except the atmosphere, which, throughout the mine, is so strongly impregnated with mercurial vapour as frequently to produce salivation in the workmen. On entering, we descended by 727 steps to the depth of 120 fathoms, when we arrived at the region where the cinnabar is chiefly procured. The mining operations are carried on in galleries, the friable nature of the

rock not admitting of the formation of large chambers. The cinnabar is in strata of from two to six inches in thickness; sometimes it is of a brilliant scarlet, and in small crystals, but generally it is of a dull red, and in large masses of solid stone, which is, however, so brittle, as to be easily broken by a common pickaxe. The quicksilver is sometimes mixed with the cinnabar, and sometimes occurs imbedded in a friable rock, in particles too minute for the naked eye, but which, when the rock is broken, present themselves in small globules, varying from a size just large enough to be seen, up to that of a common pin's head." The travellers descending still lower, soon came to the richest part of the mine, where the globules of quicksilver are so large, that when the earth is broken they roll out and fall to the bottom of the gallery. The labourers in this place are relieved every four hours, being unable, from the state of the atmosphere, to work longer than this at one time, though in the other parts of the mine they are only relieved every eight hours. The quicksilver which is found in globules, only requires to be washed to separate it from any loose particles of earthy matter which may adhere to it; but the quicksilver that is mixed with rock, requires to be exposed to the action of heat, which forces the quicksilver to rise in the form of vapour, and this, passing into the small chambers adjoining the furnace, is so thoroughly condensed by the cold atmosphere around them, that when the process is over, and the doorways of the chambers are opened, the quicksilver is found adhering in drops to the sides and ceilings. "The cleaning process is very simple, a piece of canvas being merely spread

over a funnel, and the quicksilver, being made to pass through it, comes out pure. That intended for home consumption is tied up in sheep's skins, while that for exportation is put into iron bottles, each of which contains sixty eight pounds weight. The furnace is kept in operation only during the winter months, and even then the smoke is a serious annoyance to the town."

There are several other quicksilver mines in different parts of Europe, but those which have been already mentioned are the most important.

COPPER MINES.

COPPER mines are found in many countries, and there is a tradition that the copper mines of Spain were worked in the time of the Carthaginians; but "the most extensive and productive copper mine in the world is that of Fahlun, in the province of Dalecarlia, in Sweden. The mining district occupies a space of nine leagues in length by two and a half in breadth, and is surrounded by a reddish granite, which becomes of a finer grain as it approaches the centre of this space, and is then succeeded by a micaceous rock dividing into rhomboidal fragments. The principal mass, which is of enormous dimensions, consists of iron and copper pyrites lying in a vertical position from north-west to south-east, along the valley in which it is deposited. Here there is an immense opening or gulf 840 feet in length, 720 in breadth, and 240 in depth, which was produced in the year 1687, by the falling in of the superincumbent mass, in consequence of the unskilful manner in which the subterranean operations had been conducted. In this celebrated mine the mass

of ore is described as lying in the form of an inverted cone, and the excavation has been carried to a depth of more than 200 fathoms; but it is supposed that this is nearly the utmost extent to which the mass of ore penetrates the earth, as latterly the operations have been conducted upon a more limited scale than in former times. It was in this mine that Gustavus Vasa, when driven from his throne, worked for a time, to procure the means of subsistence." In the mine of Garpenberg, about eighteen leagues from that of Fahlun, there are fourteen veins in a vertical position, all parallel with each other.

The principal copper mines of Great Britain are in Cornwall; but there are others in Anglesea and Wales, and there was one also in Staffordshire, which was once reckoned one of the most productive in the kingdom. The mines in Cornwall are sometimes wrought to a very great depth; and between Truro and Redruth, there is one the shaft of which is 265 fathoms deep.

IRON MINES.

THE iron mines of the Island of Elba are said to be the richest in the world, and their existence appears to have been known from the earliest times. The ore is of the specular kind, and the mass constitutes an entire mountain, surrounded by others consisting of granite, of which the greater part of the island is composed. This mountain, which is called Rio, is about 500 feet in height, and three miles in circumference; and its surface is covered with a reddish kind of earth, full of shining scales of iron. Beneath this slight covering the mountain consists of one mass of

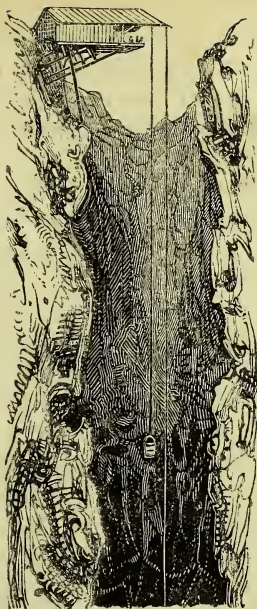
metal, or rather, of an immense number of accumulated masses, thrown together without the slightest attempt at stratification. The mines of Elba were wrought in the time of the Romans, and it is supposed that the mass of iron they contain extends from the island under the sea to the adjoining continent.

The iron mines of Sweden have long been celebrated; and the most remarkable are those of Dannemora, in which from twelve to fifteen hundred people are constantly employed.

The opening of this mine is of great extent, and in it there are twelve pits in which mining operations are carried on. These pits are deep excavations like gravel pits, forming so many gulfs. "The descent into them is by means of baskets or buckets, each attached to a rope, which passes over a pulley; much as if there were a projection from the top of Salisbury steeple, from which, in a basket, one could be let down to the ground."

There are also extensive mines in Norway and the Ural mountains, as well as those in this country.

Iron has been wrought in England since the time of the Romans, by whom iron works were established in the Forest of Dean in Gloucestershire. The iron works in this country are now very extensive, and it is estimated that they produce between five and six millions a year. The principal iron works of England are in the district round Birmingham and at Colbrook Dale. In Wales and Scotland are very extensive iron works, particularly those at Merthyr Tydvil in the former country, and at Carron in the latter.



DESCENT TO THE IRON MINES OF PRESEBY IN SWEDEN.

TIN MINES.

THE tin mines of Cornwall are supposed to have been worked upwards of 2,400 years, as they were known to the Phœnicians, who traded thither for tin. It is supposed, however, that the only one then worked was the stream tin, which is the most accessible. Tin, however, is now found not only in streams or veins, but in combination with copper and other metallic ores, or disseminated through the whole substance of granite and other rocks, which must be exposed to a

strong degree of heat before the tin can be separated from them. Even when the tin is produced in veins, in some places tin and copper veins are united, and run parallel to each other, in a kind of double vein, of which the copper forms one side, and the tin the other.

There are tin mines in France, Portugal, and Germany, and in most cases the veins of tin, which are about six feet in thickness, are enclosed in granite. At Ehrenfriedersdorf, however, the mountain in which the tin lies, is of a kind of clay, and it contains a great number of parallel veins almost touching each other. In the Kaff mountain in Bohemia, there is a tin mine in which iron lies over the vein, and it is supposed that there is silver below it; but the most remarkable tin mine in Bohemia is that of Schlackenwald, in which the ore is contained in an enormous mass of granite, shaped like an inverted cone, and which is entirely surrounded by a rock of a different kind, while throughout the whole of the granite are disseminated innumerable grains of tin, which are so minute, that it requires ten thousand quintals of rock to yield thirty five quintals of tin.

COAL MINES.

THE coal mines of Great Britain are of extraordinary extent and value, and, in fact, the prosperity of England depends in a great measure upon these extensive coal mines. It is supposed that the coal mines of Great Britain produce upwards of £8,000,000 sterling a year. Accidents in these coal mines are very frequent, partly from the explosions of inflammable gas, and partly from the presence of carbonic acid gas or choke damp

as it is called. It appears from the returns that upwards of 20,000 persons lost their lives in coal mines in Great Britain in little more than twenty years. Numerous plans have been adopted to prevent these accidents, particularly what is called Sir Humphrey Davy's safety lamp, but it does not appear to deserve that name, as many very serious accidents have happened in collieries where it has been in constant use.

SALT MINES.

THE principal salt mines in England are in Cheshire, but there are brine springs, and it is supposed also salt mines, at Droitwich in Worcestershire, though the mines have not been worked. The first bed of fossil salt that was found in England was in 1670, when it was discovered about thirty-four yards below the surface in searching for coal in the neighbourhood of Northwich. About 100 years later a second bed of fossil salt was discovered near Lawton, about forty two yards below the surface; and others have since been discovered in various parts of the surrounding country. These salt beds are generally of an enormous thickness, and when one is pierced through, after passing through a thin layer of indurated clay, another bed of salt, of still greater thickness than the first, is generally found beneath.

Mines of rock salt occur in Hungary, the southern part of Germany, at Vic in France, and also at Wielitza, near Cracow; the last being considered the most extensive salt mines in the world. The length of the great mine from east to west is 6,000 feet, and its breadth from north to south is 2,000 feet; its greatest

depth is 800. From the enormous size of this mine, it may be considered as a city underground, in which there are public roads and chapels. Numerous horses are employed to draw the blocks of salt to the mouth of the mine, and these horses, when once let down, remain during the whole of their lives. This, however, though told as wonderful, is by no means uncommon, as it occurs in many of the mines in Cornwall. There are also boys in the mines in both countries, who have either been born in the mines, or have been sent there so young that they have no recollection of ever having trodden on the surface of the earth. The most remarkable part of the salt mines of Poland is the chapel, which is hewn out of the salt rock, and has a large figure of our Saviour on the cross, formed also of salt. The number of men employed in this mine is said to be about 700.

FOSSILS.

FOSSILS are so called from a Latin word signifying that which may be dug out of the earth, which word, Professor Ansted informs us, was originally used in England as synonymous with mineral, but which has become now limited to its present meaning; or, in other words, synonymous with organic remains. Organic remains have been defined to be those "animal and vegetable substances which are contained in rocky strata, or found loose in the earth."

Fossils are of various kinds, but those which are most distinct and most numerous are of extinct animals, shells, and plants. Most of the shells are of kinds still in existence; but of the plants, many of the

kinds are now rarely to be met with, and others are found in climates too cold for them now to exist in a living state. The most interesting fossils are, however, the remains of animals and zoophytes which have now become extinct, particularly those immense creatures of the lizard kind, which are totally unlike any animals now existing. One of these, the *Ichthyosaurus*, has a head like a lizard, armed with conical and pointed teeth; enormous eyes; and four limbs which can hardly be described, as they seem to have been something between paddles and feet. These animals, of which four species have been discovered, and of which the smallest is upwards of twenty feet long, have been only found imbedded in a kind of rock called oolite, and in the lias limestone.

They appear, from their construction, to have been carnivorous; and Professor Ansted has given us a striking description, in his *Picturesque Sketches of Creation*, of what he imagines to have been their habits.

“But let us see,” he says, speaking of the early ages of the world, “what is going on in the deep abysses of the ocean, where a free space is given for the operations of that fiercely carnivorous marine reptile, the *Ichthyosaurus*. Prowling about at a great depth, where the reptilian structure of its lungs, and the bony apparatus of its ribs, would allow it to remain for a long time without coming to the air to breathe, we may fancy we see this strange animal, with its enormous eyes directed upwards, and glaring like globes of fire; its length is some thirty or forty feet, its head being six or eight feet long; and it has paddles and tail like a shark; its whole energies are fixed on what is going on above, where perhaps some gi-

gantic fish is seen devouring its prey. Suddenly striking with its short but compact paddles, and obtaining a powerful impetus by flapping its large tail, the monster darts through the water at a rate which the eye can scarcely follow towards the surface. The vast jaws, lined with formidable rows of teeth, soon open wide to their full extent; the object of attack is approached—is overtaken. With a motion quicker than thought the jaws are snapped together, and the work is done. The monster becoming gorged, floats languidly near the surface, with a portion of the top of its head and its nostrils visible, like an island covered with black mud, above the water.” Though this sketch is purely imaginative, it is very probable that it may be quite correct, as, from the remains of the reptile which have been discovered, it was evidently capable of all that has been described.

The *Plesiosaurus* is still more extraordinary in its formation; for it has a slender neck, as long as its body, rising from the lizard-like trunk, like the body of a serpent fixed on that of a lizard, and terminating in a very small head. Five species of this hydra-like monster have been discovered. The following is Professor Ansted’s description of a *Plesiosaurus*.

“Imagine one of these monstrous animals, some sixteen or twenty feet long, with a small wedge-shaped crocodilian head, a long arched serpent-like neck, a short compact body, provided with four large and powerful paddles, almost developed into hands; an animal not covered with brilliant scales, but with a black slimy skin. Imagine for a moment this creature slowly emerging from the muddy banks, and half walking, half creeping along, making its way towards

the nearest water. Arrived at the water, we can understand from its structure that it was likely to exhibit greater energy. Unlike the crocodile tribe, however, in all its proportions, it must have been dissimilar in habit. Perhaps, instead of concealing itself in mud or among rushes, it would swim at once boldly and directly to the attack. Its enormous neck, stretched out to its full length, and its tail acting as a rudder, the powerful and frequent strokes of its four large paddles would, at once, give it an impulse, sending it through the water at a very rapid rate. When within reach of its prey, we may almost fancy that we see it drawing back its long neck, as it depressed its body in the water, until the strength of the muscular apparatus with which this neck was provided, and the great additional impetus given by the rapid advance of the animal, would combine to produce a stroke from the pointed head which few living animals could resist. The fishes, including perhaps even the sharks, the larger cuttle fish, and innumerable inhabitants of the deep, would fall an easy prey to this monster."

The *Pterodactyl* is the most singular of all these inhabitants of a former world. In its external form, says Professor Ansted, it "probably resembled the bats or vampires; and some of the species attained the size of a cormorant, though others were not larger than a snipe. The resemblance, however, to the bat tribe, was limited to the form of the body, for the head was totally different, the snout being enormously elongated, and the eyes exceedingly large; while the organs of flight or wings were even more powerful in proportion, and the legs were probably capable of

being used in water, and assisting the animal to swim. The neck also was long and like that of a bird." This extraordinary creature had sixty enormous teeth in its great jaws, and "the whole of the proportions of the head indicate a creature of great strength, capable either of darting down upon fishes, or preying upon the smaller land animals." The neck appears to have been very long; and an unusual provision is observable in it, "assisting to give additional strength to the head; a set of bony tendons running along the vertebræ for this purpose. The length of the neck corresponds with what we see in birds, and indicates a perfect adaptation of the animal for rapid and long continued flight. In one specimen the head is thrown back so far, that the base of the skull almost touches the tail, without the bones appearing to be in an unnatural position." One of the peculiarities of this singular creature is, that it appears to have had a complete apparatus for walking as well as flying. "In order to effect this," Professor Ansted observes, "the bones of the fore extremity, so far as regards the shoulder and arm-bones, the wrist, and the hand, scarcely differ from the ordinary proportions of those bones in lizards, and correspond with the dimensions of the hinder extremity, so that up to this point there is no peculiar adaptation for flying. On examining the bones of the fingers, however, we find that the number of joints in that which corresponds to the little finger is increased to five, and each joint is enormously lengthened. To the whole of the little finger, thus produced till it has become longer than the body and neck together, a membranous wing was attached, which was also fastened to the rest of the arm, to the body, and to a portion of the hinder ex-

tremity. When, therefore, the arm was extended, the wing was not necessarily expanded, and only became so on the little finger being also stretched out so as to be at right angles to the arm; and the membrane was then nearly surrounded on four sides by bone. By this contrivance the necessity of employing the whole arm in the mechanism of flying as in the bird, or the whole hand as in the bat, was done away with, and the flying apparatus being confined to one finger, the arms and hands could be readily and conveniently made use of like the corresponding extremities of other animals." It appears, therefore, that this remarkable creature, which, in all points of bony structure from the teeth to the extremity of the nails, presents the characteristics of a reptile, was at the same time provided with the means of flying; and as its wings, when not in use, might be folded back like those of a bird, and its toes were free, that it could, at pleasure, stand firmly on the ground, walk about, climb rocks and cliffs, and possibly also swim in the ocean. Its usual position, when not in motion, or suspended from the branches of a tree, would probably be standing on its hind feet, with its neck set up and curved backwards, lest the weight of its enormous head should disturb its equilibrium.

The remains of many other very curious reptiles have been found, particularly some which appear to belong to a gigantic animal of the frog kind, the footmark of which resembles the impression of a human hand; but the remains which have been discovered of these creatures are not sufficiently distinct to give any clear idea of their exact form. There are also two or three kinds of gigantic tortoise.

The bones of several quadrupeds have been discovered, which are now quite extinct. Some of these are of moderate size, such as a species of tapir, and a kind of antelope; but others are enormously large, and one of the most remarkable of these is what is called the *Dinotherium*, from two Greek words, signifying a fearfully large beast. Of this creature, Professor Ansted observes, "It dwelt probably in swamps. Its length was nearly twenty feet; its body huge and barrel-shaped, very much resembling that of the hippopotamus, being little raised above the ground, although the huge columns which formed its legs are supposed to have been nearly ten feet in length. Its head, rarely, perhaps, brought entirely above the water, was like that of a large elephant, and it was provided with a short, but very muscular and powerful proboscis. A pair of large and long tusks were appended to this skull, and curve downwards, as in the walrus." But, it is a most remarkable fact that these tusks do not proceed from the upper jaw, where they would be supported by the bones of the neck, but are fixed in the lower jaw, which they seem to have drawn down in the most uncomfortable manner. "There can scarcely be a doubt," Mr. Ansted observes, "than an animal provided with appendages so placed was an inhabitant of the water, and the tusks, which are very large, were probably useful as pick-axes," enabling the creature to dig for food by day, and perhaps serving as anchors to retain it in a safe place during the night.

Many traces have been found of gigantic birds which have now completely disappeared, particularly of a wingless bird, called the *Dinornis*, which appears to have been about seventeen feet high. Impressions of

the feet of birds, apparently resembling the ostrich, which must have been of enormous size, are also frequently found on sandstone and the lias limestone, in various parts of Great Britain, particularly on the south coast of England, and in the west of Scotland. Specimens of a similar nature are also found on various parts of the Continent.

Impressions of fishes of various kinds have been found, some of which are very distinct, while others are so much decayed, that it is scarcely possible to ascertain what their original form has been. "This condition," observes Mr. Ansted, "is partly owing to the nature of the bed which must have been originally a fine mud, in which the fish had rotted after death, when the bones separating, and the fins becoming detached, the thin fragile scales, unlike the bony enamelled case of the older fishes, would not afford a coating solid enough to preserve the integrity of the form." Many, however, are found sufficiently perfect to be classed; and though many are of species that are still common, others have become extinct. Among the latter is one very curious kind, which has "a fin rising like an immense mast behind the head, to a height far greater than the length of the body."

The most interesting organic remains are, however, those of the zoophytes, and of the crustaceous and molluscos animals. Among the zoophytes the most curious are what are called the "*Encrinites* or Crinoidal animals, because many of them exhibit the appearance of a cup-shaped flower, opening on the top of a stalk; this flower-like shape being comparatively simple in many species, while in others there is a complication in the number of branches stretching

out from the principal stalk, and in the multitude of arms and fingers projecting from the aperture of the mouth, which seems quite unrivalled in complexity in any other animal, whether recent or extinct." The Dudley Encrinites or stone lilies, as they are popularly called, are remarkably fine, and of many different kinds. They appear to have been complete zoophytes, growing out of the soft mud in the beds of ponds and rivers, with a root like a plant, the body of an animal, and long arms or feelers; the body and feelers forming what may be considered the flower of the zoophyte. The stalk was composed of numerous rings like vertebræ, which are now often found distinct and in different places. To conceive the appearance of another of these animals, Professor Ansted observes, "we must imagine trunks of trees in the primitive ages of the world floating in the sea, and attached to them in large clusters, like the bunches of barnacles sometimes suspended from a ship's bottom, the singular pentacrinites, their long stony columns fringed thickly with branches of articulated stone, with a strong coat of mail surrounding the pouch or stomach, and a similar but more delicate defence covering the extensile proboscis. With innumerable arms widely extended in a complicated fringe, this strange mass of living stone expanded itself, and drew within its cold embrace the floating bodies on which it fed."

Corals and Madrepores are zoophytes of which very beautiful remains are found in a fossil state. These remains consist of what seem to have been the horny skeletons of animals similar to those which form the corals that are met with at the present day. They were formed like these by an immense

multitude of polyps, the whole, as Professor Ansted expresses it, "constituting a kind of compound animal, in which each individual works to increase the general mass, and is affected by that which affects this mass; but each, also, has a separate existence, being provided with a stomach and arms, to obtain and digest food, and capable of being injured or destroyed without the functions of the complete body being at all interfered with."

Among the corallines or small corals, the most beautiful organic remains belong to those called *Aulopora* and *Catenipora*. The first, which is simple and flower-like, is common among the oldest fossiliferous rocks, and closely resembles many species which are yet found in the southern and tropical seas. The other kind, which is popularly called the chain coral, is extremely common among the rocks at Dudley and other silurian localities.

The *Trilobites* were very curious crustaceous animals. "These," Professor Ansted observes, "were provided with a large semicircular or crescent-shaped shield, completely defending the head; the body was in like manner secured from the attack of an enemy, by a number of plates or segments moving readily upon one another, like the horny plates of a shrimp; and the tail was armed with a similar series. The animal seems not to have had antennæ, and to have possessed short and rudimentary legs; but on the head were placed a pair of large conical projections covered with eyes, by the help of which any approaching danger might be seen; and the power of rolling itself into a ball, which it possessed in common with the wood-louse and the chiton, enabled this creature,

no doubt, to escape the attack of many of its enemies. It is not very easy either to make out the habits of an animal of such singular organization and of which only the hard external coat is preserved, or to speculate with regard to its food, and its method of obtaining it. From the absence of antennæ, however, and the want of powerful extremities, as well as from the manner in which these fossils are found (for they seem to have been very gregarious, living by thousands in a single locality, and often heaped upon one another), the different species probably lived for the most part in shallow water, not buried in mud, but floating near the surface with their under side uppermost, feeding on the minute and perhaps microscopic animalcules that usually abound in such localities. There are several natural groups, marked by differences somewhat considerable, but the number of species is not great. The most remarkable point with regard to these trilobites is the presence of the large compound eyes with which they were provided. These eyes appear to be constructed on the same principle as those of the dragon-fly and other insects: they are ranged round about three-fourths of two conical projections rising one from each side of the head, and they are so placed that the animal, without moving from the spot in which it might be, could see in all directions around it." The trilobites are found in the greatest abundance at Dudley and its vicinity.

Among the shells the most interesting are what are called the *Ammonites*, or the shell of an animal somewhat similar to the Nautilus, but having a connecting siphon on the outside, instead of within. The

Belemnite "has received its name," says Professor Ansted, "from a peculiar dart-shaped stony fossil, and which, under various local names, such as the thunderbolt, &c., is familiar to most people in the different parts of England where it occurs abundantly. It is found varying in size from specimens not an inch long, to others measuring upwards of a foot; but the structure is generally seen to be the same, the fossil when complete being more or less cylindrical, with one conical extremity, the other end widening out and exhibiting a conical hollow, which is sometimes filled up with a number of little cup-shaped bodies like watch-glasses, fitting into one another." Naturalists were long puzzled with regard to this fossil, but its history is now perfectly cleared up "by the aid of specimens which not only exhibit all the solid parts in their natural position, but even present to our notice the muscular fibre, very little altered. The whole contour of the animal is, indeed, accurately determined, including the feelers projecting from the head, the fins, the tail, and even a solidified dark fluid once preserved within the body, and intended to serve the living animal as a defence from its enemies, by enabling it to cloud the surrounding water when attacked or desirous of concealment." The fossil known to geologists by the name of *Belemnite* is the internal skeleton of an animal very much like the cuttle-fish, but provided, not only with a solid framework for the attachment of muscles, but also with an apparatus like that possessed by the *Nautilus* and the *Ammonite*. The animal of the *Belemnite* was enclosed within a muscular shape, which formed a kind of closed bag termina-

ting above with the head. "From around this eight arms proceeded, whose length in the species examined seems to be about one-fourth part of the entire length of the animal; and each arm was provided with from fifteen to twenty pairs of hooks, resembling those now seen only in the most powerful and the fiercest of the whole tribe of Cephalopoda, and used to pierce the flesh of fishes and other animals, in order to secure firm hold when the Belemnite was about to seize its prey. The head was provided with very large eyes; the jaws were probably horny; and, besides the eight arms, there seems to have been one pair of long tentacles. Far down below the head, and within the cavity of the shell, there was placed an oval sac containing a black fluid, communicating by a tube with the aperture. This fluid exactly resembles the ink of the common cuttle-fish; and there can be no doubt that it was used by the animal in the same way, and for the same purpose, namely, to darken the water when its possessor, becoming alarmed, desired to escape. The ink itself in a solid state, the bag which contained it, and the tube or pen by which it was shot out into the water, are all preserved in some of the specimens of this fossil. The mantle of the Belemnite, passing over the guard or shell, seems to have accommodated itself to the shape of the shell, and terminated in a blunt point. Two fins, however, of a rounded form, and of considerable size, extended on each side near the middle of the animal. From this position of the fins, from the shape of the shell, and from its general structure, it has been concluded that the animal commonly remained in a vertical position, rising and sinking with great

facility, and possessing very unusual powers of locomotion and destruction."

CHAPTER VII.

EARTHQUAKES.

AFTER speaking of the wonders which are found on the surface of the earth, and in its recesses, it now seems natural to say a few words on those violent convulsions of nature, which appear occasionally to shake it to its centre, and to effect the most extraordinary changes in its outward appearance. There appears but little doubt that earthquakes are intimately connected with volcanoes, though it is very difficult to understand how the subterraneous vapours which occasion them are generated, and in what way they gain sufficient force, to produce the extraordinary effects which we see result from them, at such a great depth from the surface of the ground. In the great earthquake which took place in Asia' Minor in the seventeenth year of the Christian era, and which destroyed thirteen great cities in one night, and shook a mass of earth 300 miles in diameter, it has been calculated that the moving power, supposing it to have been internal fire or vapour, must have been launched 200 miles below the surface of the earth.

Another great earthquake destroyed the city of Antioch. Another threw down the famous Colossus of Rhodes. In more modern times, we find descriptions of the earthquake at Puteoli, which occasioned the sea to retire 200 yards from its former bed; the earth-

quake in Calabria in 1638, which was evidently connected with an eruption of Mount *Ætna*, and by which the city of Euphemia was swallowed up; and the great earthquake of 1755, which completely destroyed the city of Lisbon.

The Lisbon earthquake extended over a space nearly equal to four millions of square miles; but the city of Lisbon appears to have been in the centre of its fury. On the 1st of November, about forty minutes past nine in the morning, the shock was felt at Lisbon; and though it only lasted six seconds, it overthrew every church and large building in the city.

It is a remarkable circumstance attending this earthquake, that it was felt almost as violently at sea as it was on land, and that the master of a ship, fifty leagues from Lisbon, felt the shock of the first earthquake so decidedly, that he fancied he had mistaken his reckoning and had struck on a rock. This great earthquake was felt in many other places, even in England, particularly at Eyam Bridge, near the Peak in Derbyshire, where the overseer of the lead-mines, sitting in his writing-room, felt the chair in which he was sitting raised up and set down again, so decidedly that he distinctly felt his feet were raised from the ground. Of course he was exceedingly frightened, and ran out to see if anything had happened, when he met the miners running in different directions from the mine all excessively terrified, and each having something to relate which had happened to himself. One had seen the rocks move, another had heard them grind one upon another, and all had been terrified with a fearful rumbling like groans, which appeared to come from the bowels of the earth. At White Rock, in

Glamorganshire, about three-quarters past six in the evening, and about two hours after the ebb of the tide, an immense quantity of water rushed up with a prodigious noise, floated two large vessels, the least of which was of 200 tons burden, and swept them from their moorings, driving them down the river with such extraordinary impetuosity that it almost upset them. "The whole rise and fall of this extraordinary body of water did not last above ten minutes, nor was it felt in any other part of the river, so that it seemed to have gushed out of the earth at that place." Among the other remarkable phenomena which attended this earthquake, was the drying up of numerous springs in various parts of the world, and the breaking forth of others.

THE CALABRIAN EARTHQUAKES.

THESE earthquakes began on the 5th of February, 1783; and they continued till the latter end of the following May, doing a great deal of mischief in Sicily and the two Calabrias. During the first month after their commencement, the earth appeared in a constant tremour, and its motions were various, sometimes moving horizontally, and sometimes by pulsations or beatings from the bottom upwards. "This variety increased the apprehensions of the unfortunate inhabitants, who momentarily expected that the earth would open beneath their feet, and swallow them up. The rains had been continual and violent, often accompanied by lightning and furious gusts of wind. There were many openings and cracks in the earth; and several hills had been lowered, while others were made quite level. In the plains, the chasms were so deep, that many roads were ren-

dered impassable. Huge mountains were severed, and portions of them driven into the valleys, which were thus filled up. The course of several rivers was changed; and many springs of water appeared in places which had before been perfectly dry."

Sir William Hamilton, who has given a very circumstantial account of these earthquakes, is decidedly of opinion that they were caused by some great operation of nature of a volcanic kind. He found that in every case the shocks had been preceded by a rumbling noise from the westward, and that they had begun with a horizontal motion, ending with a whirling movement so violent that the tops of the largest trees almost touched the ground from side to side. The oxen and horses seemed to prepare themselves for each shock, standing with their legs as wide asunder as possible, in order to prevent themselves from being thrown down. In one situation, a piece of ground a mile in length, and half a mile in breadth, with two cottages, and several large olive and mulberry trees, was lifted up and floated about a mile down the valley, where it remained with the houses and most of the trees erect. In another place, two huge portions of ground, on which stood several hundred houses, were detached from the town to which they belonged, and carried half a mile across a ravine. Of course most of the houses which made this extraordinary leap were thrown down; but many of the inhabitants who were in them were dug out alive, and several of them completely unhurt. Many similar accidents were found to have happened in various places, and the same effects were produced on the springs as had been noticed in other earthquakes.

EARTHQUAKE OF JAMAICA.

THE earthquake of Jamaica, in 1692, is one of the most dreadful that history has to record. It was attended with a hollow rumbling noise like that of thunder, and in less than a minute all the houses on one side of the principal street in the town of Port Royal sank into a fearful gulf forty fathoms deep, and water came roaring up where the houses had been. On the other side of the street the ground rose up and down like the waves of the sea, raising the houses and throwing them into heaps as it subsided. In another part of the town the street cracked along all its length, and the houses appeared suddenly twice as far apart as they were before. In many places the earth opened and closed again, so that several hundred of these openings were to be seen at the same time; and, as the wretched inhabitants ran out of their tottering dwellings, the earth opened under their feet, and in some cases swallowed them up entirely; while in others, the earth suddenly closing, caught them by the middle, and thus crushed them to death. In some cases these fearful openings spouted up cataracts of water, which were attended by a most noisome stench. It is not possible for any place to exhibit a scene of greater desolation than the whole island presented at this period. The thundering bel-
lowing of the distant mountains, the dusky gloom of the sky, and the crash of the falling buildings gave unspeakable horror to the scene. Such of the inhabitants as were saved sought shelter on board the ships in the harbour, and remained there for more than two months, the shocks continuing with more or less vio-

lence every day. When, at length, the inhabitants were enabled to return, they found the whole face of the country changed. Very few of the houses which had not been swallowed up were left standing, and what had been cultivated plantations were converted into large pools of water. The greater part of the rivers had been choked up by the falling in of detached masses of the mountains, and spreading over the valleys, they had changed what was once fertile soil into morasses, which could only be drained by cutting new channels for the rivers; while the mountains themselves had changed their shapes so completely, that it was conjectured that they had formed the chief seat of the earthquake.

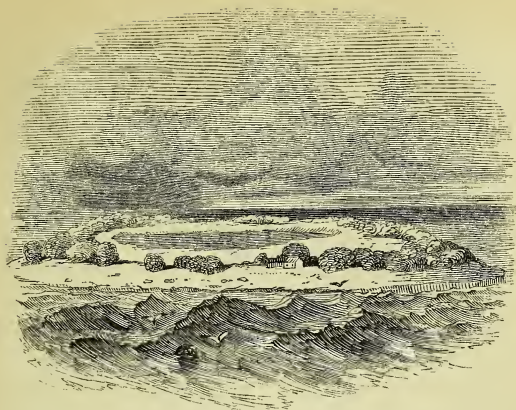
CHAPTER VIII.

ISLANDS.

AN account has already been given of the sudden appearance of several islands that were evidently of volcanic origin; but new islands are occasionally formed under other circumstances. Of this nature are the coral reefs of the Indian and Pacific Oceans, and the floating island of one of the lakes of Cumberland.

CORAL REEFS.

THROUGHOUT the whole range of the Indian and Pacific Oceans, are to be seen in different places what are called lagoon islands in different stages of growth, from coral banks, just gleaming through the deep water, like the rocks of Alacran, on which the Tweed was



CORAL REEFS.

wrecked on the 12th of February, 1847, to perfect islands covered with a variety of trees and shrubs, which give food to paroquets, pigeons, and other birds.

The nature of the polypes which form coral has been already described when speaking of fossils, (p. 158,) and those which form the coral islands are of exactly the same nature. They belong to the lowest order of animated beings; they are radiated and star-like in their forms, and are generally incapable of locomotion; yet they possess the power of excreting from the lower part of their bodies a large quantity of calcareous matter, which is necessary to each animal, in order to form the cells or polypidom, in one of whose hollows it lives, its companions living in other similar hollows of the same polypidom, and being all affected alike by everything that affects the mass, though each polyp has a separate existence, and may be termed a distinct individual. Thus these little animals build their stone-

houses, adding compartment after compartment; and, as Professor Ansted observes, "erecting in succession one story after another," they continue at their work "month after month, year after year, and century after century;" one generation following another, till in time these little insignificant and feeble animals have actually added numerous islands to the solid matter of our globe. "The prodigious extent of the combined and unintermitting labours of these little world-architects," says Professor Ansted, "must be witnessed, in order to be adequately conceived or realized. They have built up 400 miles of barrier reef on the shores of New Caledonia; and on the north-east coast of Australia their labours extend for 1000 miles in length; and their reefs, which may average, perhaps, a quarter of a mile in breadth, and 150 feet in depth, have been built amidst the waves of the ocean, and in defiance of its fiercest storms." Similar reefs are in progress in the Indian Ocean; and a group of these, called the Keeling or Cocos Islands, are described at length by Mr. Darwin, who visited them as naturalist on board the ship *Beagle* in 1836. Nothing can be more singular than the appearance of these islands: a ring is first formed consisting only of coral reefs, and enclosing a lagoon, or lake of salt water. The effect of the scenery thus produced is very striking, though it depends almost entirely upon colour. "The shallow, clear, and still water of the lagoon, resting in its greater part on white sand, is, when illumined by a vertical sun, of the most vivid green. This brilliant expanse, several miles in width, is on all sides divided, either by a line of snow-white breakers from the dark heaving waters of the ocean, or from the blue vault of heaven by the

strips of land, crowned by the level tops of the cocoa-nut trees. As a white cloud here and there affords a pleasing contrast with the azure sky, so, in the lagoon, bands of living coral occasionally darken the emerald green water." On reaching one of these islands, or rather reefs, Mr. Darwin went on shore, and found the strip of dry land was only a few hundred yards in width. On the lagoon side there was a white calcareous beach; and on the outer coast a solid broad flat mass of coral rock, which served to break the violence of the open sea. Where the island consists only of a ring of coral reefs, it is called an atoll, or lagoon island; but gradually the coral reefs become covered with earth, as they serve as a barrier to arrest the sand, which is continually being carried by the great rivers into the sea, and held in solution by its waters. As soon as a little earth has been collected on the coral, the seeds of different trees, which have been carried onwards by the currents of the ocean, are deposited, and cocoa-palms and other plants spring up; while the leaves and fruit of these, as they fall and decay, form fresh soil, from which additional plants spring; and thus by degrees the lagoons become filled, and a complete island formed. At the border near the sea the lagoon islands present large fields of coral rising above the water, and interspersed with gigantic shells of the common Chama (*Tridacna gigantea*); but when Mr. Darwin examined these coral fields, he found that the whole forest of delicately branching corals, though standing upright, were all dead and rotten, as it appears that corals are not able to survive even a short exposure in the air to the sun's rays; so that their upward limit of growth is determined by that of lowest water at spring

tides. The coral when thus rotted crumbles into mud, and this mud helps to fill up the lagoons. In some of the islands stones of various kinds have occasionally been found mixed with the mud, but they have been apparently carried there by the currents of the ocean, probably entangled in the roots of some tree; as stones are so rare on the lagoon islands generally, that some of the natives of a group of lagoon islands in the midst of the Pacific, when carried by Kotzebue to Kamtschatka, collected stones there to take back with them to their own country. Besides the atolls, or rings of coral reefs, the corals sometimes extend in straight lines in front of the shores of a continent or of a large island, or they encircle smaller islands; "in both cases being separated from the land by a broad and rather deep channel of water analogous to the lagoon within an atoll." These are called barrier reefs, and though they are of very great extent, in some cases "the whole line of reef has been converted into land, but usually a snow-white line of great breakers, with only here and there a single low islet crowned with cocoa-nut trees, divides the dark heaving waters of the ocean from the light green expanse of the lagoon-channel. And the quiet waters of the channel generally bathe a fringe of low alluvial soil, loaded with the most beautiful productions of the Tropics, and lying at the foot of the wild, abrupt, central mountains. Encircling barrier reefs are of all sizes, from three miles to no less than forty-four miles in diameter, and that which fronts one side, and encircles both ends, of New Caledonia is 400 miles long. Each reef includes one or more rocky islands of various heights, and in one instance even as many as twelve separate islands." The reefs vary in

their distance from the shore, in some cases approaching even within one mile of it, and in others being upwards of twenty miles, with all the varying distances between these two extremes. The third class consists of what are called the fringing reefs, which, as Mr. Darwin observes, "will require a very short notice. Where the land slopes abruptly under water, these reefs are only a few yards in width, forming a mere ribbon or fringe round the shores; but where the land slopes gently under the water, the reef extends farther, sometimes even as much as a mile from the land." Mr. Darwin adds, that, "from the corals growing more vigorously on the outside, and from the noxious effect of the sediment washed inwards, the outer edge of the reef is the highest part, and between it and the land there is generally a shallow sandy channel, a few feet in depth. Where banks of sediment have accumulated near to the surface, as in parts of the West Indies, they sometimes become fringed with corals, and hence in some degree resemble lagoon-islands, or atolls; in the same manner as fringing reefs, surrounding gently sloping islands, in some degree resemble barrier reefs."

FLOATING ISLAND IN DERWENTWATER.

THE *Floating Island* in Derwentwater, in Cumberland, is supposed to be a portion of the peaty bottom of the lake, "which, from some cause not very clearly explained, occasionally rises to the surface. The most probable supposition is, that the mass is swollen and buoyed up by gas, produced by the decomposition of vegetable matter;" as, on piercing it with a boat-hook, carburetted hydrogen gas rises in abundance.

BOOK II.

WONDERS OF THE WATERS.

CHAPTER I.

THE OCEAN.

THE great mass of water which surrounds the land, and which is supposed to cover nearly three-quarters of the whole globe, is generally called the ocean; and it is divided into the Eastern or Pacific Ocean, and the Western or Atlantic Ocean. There are other subdivisions, such as the Frozen Ocean, the Indian Ocean, &c. It is supposed that the bed of the ocean presents the same irregularity of surface as the land, and that it is diversified by mountains, plains, and valleys. No satisfactory reason has yet been given for the saltness of the sea, and its use has not yet been discovered, as it is a singular fact that this saltness does not preserve it from corruption, and it is only the constant rapidity of its motion which prevents it from becoming putrid. It is the same rapidity of motion which prevents it from freezing, as it has been proved that the sun's rays do not penetrate lower than forty-five fathoms, and yet in all countries, the temperature of the surface of the sea is from three to five degrees greater than that of the superincumbent air. The observations of Humboldt

shew that both in the Atlantic and the Pacific the waters often retain nearly the same temperature over a great extent, and that between 27° north and 27° south latitude the temperature of the sea is entirely independent of the changes of the atmosphere.

What are called tides are phenomena generally attributed to the action of the moon. The waters of the ocean are observed to flow for six hours from the south towards the north; and during this motion, or flux, the sea gradually swells, and entering the mouths of rivers, drives back the river waters towards their head. After a continued flux of six hours, the sea appears to repose for rather more than a quarter of an hour, and it then begins to ebb, or retire back from north to south for six hours more, in which time, by the subsidence of the waters, the rivers resume their natural course. When the ocean has ebbed there is another pause of about twenty minutes, after which it begins to flow as before. It will thus be seen that each ebb and flow of the tide occupies twelve hours and about three-quarters of an hour, or, to speak more exactly, twelve hours and forty-eight minutes, which is a lunar day; and, as the solar day is only twelve hours long, the moon and tide are forty-eight minutes later every day than they were the day before. Consequently, as it is necessary for all persons interested in the sailing of vessels to know the exact time of the turning of the tide, it has been found convenient, to save the trouble of calculation, to construct tide tables, in which the exact time at which the tide will serve every day is accurately stated.

Another of the phenomena of the ocean relates to what are called the currents, and which appear as yet

to be only imperfectly understood. Currents of the ocean are continual movements of its waters in a particular direction, independently of the wind. One current flows from the Azores to the Straits of Gibraltar and the Canaries. Between the Tropics, from Senegal to the Caribbean Sea, flows the equatorial current, which is the longest known, and the course of which is from east to west. Other currents flow to the north or north-west, and others to the east. Whenever a vessel gets into one of these currents flowing in the proper direction, its progress is accelerated in proportion to the rapidity of the current. The current called the Gulf-stream has a rapidity of five nautical miles an hour. The Gulf-stream is known by the elevated temperature of its waters, by their indigo blue colour, by the train of sea-weed which covers their surface, and by the heat of the surrounding atmosphere, which is very perceptible in winter. Humboldt made some curious calculations on the course and rapidity of the Gulf-stream, and found that a drop of water of the current would take two years and ten months to return to the place from which it departed. A boat not acted upon by the wind, and without any artificial means of impulsion, would go from the Canaries to the coast of Caracas in thirteen months; in ten months it would make the tour of the Gulf of Mexico; and in forty or fifty days would go from Florida to the bank of Newfoundland. The Gulf-stream furnished to Christopher Columbus indications of the existence of land to the west, as this current had carried upon the Azores the bodies of two men of an unknown race, and pieces of bamboo of enormous size. An arm of the Gulf-stream, which flows towards the coast of Europe, deposits upon the shores of Ireland

and Norway trees and fruits belonging to the torrid zone; and it was from its action that the remains of a vessel (the *Tilbury*) burnt at Jamaica were found on the coast of Scotland.

Currents are, however, often dangerous to mariners, as "they carry them sometimes insensibly from their intended course, and perhaps irresistibly bear them on to the very rocks which they know must prove their destruction. Along the coast of Guinea, if a vessel overshoots the entrance of a river to which it is bound the current prevents its return; so that it is obliged to steer out to sea, and perform a great circuit to regain the point thus lost." In February, 1847, the ship "*Tweed*" was wrecked on a coral reef between *Havannah* and *Vera Cruz*. There was no storm, but, the weather being cloudy, no observation could be taken of the sun, either on the 11th or 12th of February. However, by the ordinary mode of reckoning, the distance between the coral reef and the proper course of the ship was supposed to be about 124 miles. Unfortunately, however, the ship had got into the current of the gulf-stream, and it struck on a patch of coral reefs, distant about seventy miles from the nearest coast. On this reef the ship was dashed to pieces, and on this the few passengers that were saved remained till they could form a raft, on which they left the reef.

Among the phenomena of the ocean it may be mentioned that springs of fresh water are observed in some places to issue from the sea entirely unaffected by the salt water. The most remarkable of these are a spring in the Persian Gulf, and another on the south coast of Cuba.

The Black Sea is less salt than almost any other;

and, indeed, so little so, that carp and other fresh water fish can live in it. The tempests on this sea are tremendous, as the land which confines its agitated waters on three sides gives them a kind of whirling motion. In the winter this sea is so boisterous, particularly from the mouth of the Danube to the Crimea, that it is scarcely navigable. The chief current runs from the shallow sea of Azoph, which is, in fact, only a bay in the Black Sea, to the Hellespont. There is no island in the Black Sea, though there is one in the Bosphorus.

CHAPTER II.

LAKES.

THE general idea that people have of a lake is an accumulation of fresh water, entirely surrounded by land, and having communication with the ocean or some sea by means of a river. There are, however, some lakes which have no river either flowing into them or out of them; others that have rivers flowing into them but no apparent outlet; and others which do not receive any rivers, but have rivers continually flowing from them. These last are generally seated at the head of a river, and form a kind of reservoir for its waters, and they are often at a great height above the level of the sea. There is a lake of this kind on Mount Rotunda in Corsica, which is about 9000 feet above the level of the sea. The great majority of lakes, however, have a river flowing

through them, and this preserves the clearness and sweetness of their waters.

Those lakes which receive streams of water, and often great rivers, without having any apparent outlet, are the most extraordinary; and it was formerly supposed that each of these lakes was furnished with a subterranean channel, by means of which its waters were discharged into the ocean. This, however, is proved not to be the case, as the Dead and Caspian Seas, and the Lake Titicaca in South America, which are the largest known lakes of this description, are all many feet lower than the adjoining ocean; and if there were any communication, however small, between them, the waters of the ocean would flow into the lake, till both were raised to the same level.

Besides these kinds of lakes, there are others which are concealed in cavities covered over by the strata of different kinds of earths, and which consequently are not seen till they are brought to view by the operations of mining, digging of wells, &c. Of this nature are the numerous cavities filled with water, found in the Julian Alps; some of which appear to be the sources of rivers, while others are supposed to receive considerable streams which are known to lose themselves in the recesses of the mountains. Other lakes, which are situated above ground, periodically disappear, and their waters, most probably, flow into similar reservoirs. "That very extensive subterranean cavities exist," observes a writer on the subject, "is sufficiently attested by numerous phenomena. The disappearance of rivers, the water thrown off by volcanoes, the sudden and terrible inundation of mines, the mountains which are sometimes engulfed in the bosom of

lakes, and the springs of fresh water which spout up in the midst of the ocean, are all so many evidences of the fact. There is a district in the interior of Algiers, where the inhabitants, after digging to a depth of about 200 fathoms, invariably come to water, which flows up in such abundance that they call it the subterranean sea."

Periodical lakes exhibit some very extraordinary phenomena. Sometimes they are formed by excessive rains, which are evaporated by solar influence; and of this nature appears to be the great lake recently discovered in Australia. But there are lakes entirely independent of the rainy season, which appear and disappear at certain intervals; and of this nature is the extraordinary lake of Cirknitz in Illyria, at the bottom of which a crop of corn is sown and reaped at one season of the year, while at another, the water is sufficiently deep to float a vessel of considerable size.

"There are some lakes which present very remarkable phenomena, such as rising and falling like a tide, and boiling, or becoming agitated even during serene weather. Some of the Scottish lakes, and the Welter in Sweden, often experience violent commotion when the atmosphere is perfectly still. It seems highly probable that these agitations are connected with earthquakes, in distant countries; and a coincidence in dates on certain occasions has given countenance to this belief. In Portugal there is a small lake or pool near Beja in Alemtejo, which emits a loud noise on the approach of a storm. Other lakes appear agitated by the disengagement of subterranean gases, or by winds which blow in some cavern with which the

lake communicates. Near Boleslaw, in Bohemia, there is a lake of unfathomable depth, which sometimes in winter emits blasts of wind so strong as to elevate to some height ponderous pieces of ice. In the Marche of Brandenburg, the pool of Krestin often, even in fine weather, boils up in whirlpools, so as to engulf small fishing boats."

The depth of lakes is sometimes very great, particularly in mountainous districts, as, for example, the Lake of Geneva, has attained the enormous depth of 161 fathoms (966 feet). Some lakes in Sweden and elsewhere are said to have double bottoms, as their depth, when taken at different times, varies exceedingly; but this phenomenon is supposed to arise from the interwoven roots of trees becoming incrustated, and being suspended near the bottom of the lake, as this kind of bottom would naturally rise and fall according to circumstances.

The quality of the water of lakes differs exceedingly: those which have a river running through them are always fresh; but those which have no outlet are invariably salt. In the Dead Sea the waters contain eight times as much salt as the common sea. The water of some lakes abounds in soda, as is the case with the Natron lakes in Lower Egypt; and other lakes produce a pitchy substance, as for example the Dead Sea. In the Island of Trinidad there is a lake of this kind, upon the surface of which floats an enormous quantity of bitumen, fit for naval purposes. What is called bog iron is a deposition from the waters of lakes which are impregnated with iron, and tuffa and sinter are deposits from lakes that are fed by calcareous springs.

ASIATIC LAKES.

THE most remarkable lake in the world is what is generally called the Dead Sea. It lies in Palestine, and is about fifty miles in length and twelve or thirteen in breadth. It is surrounded by lofty mountains, and receives the waters of the river Jordan, and of some other streams, though it has no visible outlet. Copious evaporation, caused by subterraneous heat, is supposed, however, to supply the place of one. The water of the lake is clear and limpid, but excessively salt, and of greater specific gravity than any other water that has yet been discovered. The proportion of salt varies, but it appears generally to amount to nearly fifty per cent, and this enormous proportion of salt explains the difficulty that exists in diving into the waters, and the resistance they offer to the wind; so that it is quite true no one can bathe in its waters, and no winds ruffle its surface.

Another peculiarity in this lake is, that there is always a great quantity of the bituminous and inflammable substance called asphaltum, or mineral pitch, floating on its surface, which rises from the bottom of the lake in a melted state, and is condensed by the water. There is also another kind of pitch found on the shore, which, as well as the asphaltum, is used in embalming bodies, and for various other purposes. This lake is called the Dead Sea from the total want of motion in its waters; but the stories that are told of the vapours that arise from it being destructive to animal and vegetable life, are quite fallacious.

The Caspian Sea is the largest lake in the Eastern

Hemisphere, as it is about 650 miles in length, and from 100 to 250 miles in breadth. The water is less salt than that of the ocean, but it is bitter, and of a dingy yellow colour, without ebb or flow. In some places it is exceedingly deep, but as it abounds in shallows, its navigation is extremely difficult. The level of this lake is 375 feet below that of the ocean; and, though several large rivers flow into it, it has no outlet.

AMERICAN LAKES.

THE principal of these are the five lakes of Canada, viz. Superior, Huron, Ontario, Erie, and Michigan.

Lake Superior is not only the largest lake in America, but the largest expanse of fresh water in the known world. It is also remarkable for the level of its waters being several hundred feet higher than those of the river St. Lawrence, of which it may be said to be the head. The circumference of this lake is estimated at about 1,500 miles, and its waters are remarkably clear. "When it was calm," a traveller observes, "and the sun shone bright, I could sit in my canoe, where the depth was upwards of six fathoms, and could plainly see huge piles of stone at the bottom. The water at this time was pure and transparent as the air, and my canoe seemed as if it hung suspended in that element. It was impossible to look attentively through this limpid medium at the rocks beneath for even a few minutes, without feeling the head swim, and the eyes no longer able to view the dazzling scene." This occurred in the month of July, and although the surface of the water, from the heat of

the atmosphere, was warm, still, on letting down a cup to the depth of about a fathom, the water drawn thence was so extremely cold, that when taken into the mouth it had the effect of ice. Lake Superior is said to receive the waters of nearly forty rivers, one of which, just before it enters the lake, has a perpendicular fall of more than 600 feet, through a very narrow channel. The lake contains several islands, two of which are of considerable size. It has only one passage for the discharge of its waters, viz. St. Mary's Strait, which communicates with Lake Huron.

Lake Huron is about 1,000 miles in circumference ; its shape is nearly triangular, and it is united to Lake Superior by St. Mary's Strait, which is forty miles in length, and has in its course some of those falls which are called in America, Rapids, because the waters pass along a sloping bottom, and do not fall perpendicularly. This lake communicates on one side with Lake Erie, from which it is distant about eighty miles, and on the other side with Lake Michigan ; and it has on its north side a long island about 100 miles in length, and only eight broad, which is supposed by the Indians to be the abode of spirits.

Lake Erie is nearly 300 miles in its longest part. Its navigation is more dangerous than that of the other lakes, from its numerous head-lands, which project into the lake ; and when sudden storms arise, boats and canoes are frequently lost by being dashed against them.

Lake Michigan is long and narrow, and it communicates with Lake Huron by a strait about forty miles wide, called the Grand Traverse.

Lake Ontario is the smallest of these lakes, but even its circumference is about 600 miles. It communicates with Lake Erie through the river Niagara, which, after flowing nearly forty miles, discharges itself by its celebrated falls into Lake Ontario.

The Wenham Lake, from which so much ice has been brought to England, is of comparatively small size, in the State of Massachusetts.

EUROPEAN LAKES.

THESE lakes, though very inferior in size to those of America, have several very remarkable peculiarities.

Lake Lagoda, in the western part of Russia, which is the largest European lake, is 150 miles long, and ninety in breadth. It is, however, full of quicksands, which are constantly moved from place to place by the frequent storms to which the lake is subjected. This led Peter the Great to cause a canal, seventy miles long, to be cut from the lake to the sea; and, as everything is done in Russia by the military, the czar devoted a regiment of soldiers to the care of the lake and its canal; and soldiers for this purpose are still stationed along its banks.

Lake Onega is another large lake in Russia, the waters of which, though they are not salt, are frequented by seals.

There are several other large lakes in the north of Europe, particularly Lake Maler, in Sweden, which is said to contain 1,290 islands.

The most interesting lakes of Europe are, however, the Lake of Geneva, the Lake of Cirknitz, in Illyria, and Lago Maggiore, in Italy.

The Lake of Geneva has already been mentioned to be of enormous depth. In summer it has a movement which resembles the ebbing and flowing of the tide; and, as its waters are extremely clear, the waters of the Rhone, which are very muddy, may be distinctly traced through it for two or three miles.

The Lake of Cirknitz is about eight miles in length, and two in breadth. "In the beginning of June, its waters disappear through several fissures in its basin, and the peasants immediately begin to cultivate its bottom, or to pasture their herds on the rich herbage which its oozy bed soon produces." The crop is removed about the end of September, and towards the middle of October the waters return, spouting up with great force through several apertures in the earth. With these waters various kinds of fish appear, and with them is seen the curious creature called the Syren (*Anguina proteus*), which is also found in the river which runs through the Cavern of Adelsberg, and which is thus supposed to prove that there is a communication between that river and the lake. The lake may, however, communicate with some other subterranean river, as it is surrounded by limestone hills, which are known to be hollowed out into vast caverns; and these caverns are supposed to be the receptacles of subterraneous rivers, which, when augmented by autumnal rains, may overflow into a channel communicating with the Lake of Cirknitz, and when the sources of these floods fail, it seems probable that the waters of the lake may retreat to supply the deficiency. Other lakes of this kind are said to occur in Dalmatia.

Lago Maggiore is in the Duchy of Milan, and

though it is not more than six miles in breadth, it is upwards of sixty in length. It has on both sides hills covered with vineyards, and with several fine cascades falling from their sides. In one part, where the lake becomes considerably wider, are the two celebrated islands named *Isola Bella* and *Isola Madre*, which have been compared to two pyramids of confectionary. These, and two other islands in the lake, are generally called the *Borromean Isles*, as they were formed in their present state by one of the Counts *Borromeo*. This nobleman, in the year 1671, finding that there were several naked rocks in the lake, caused three of them to be covered with garden soil, building terraces to retain the soil in its proper place. Thus arose *Isola Bella* and *Isola Madre*, on which are splendid gardens and palaces; but the third island, *Isola dei Pescatori*, having had less pains bestowed upon it, is only the abode of fishermen. There is also a fourth island, called *L'Isolino*, which is much smaller than the others. The *Isola Madre*, which abounds in pheasants, lies in the middle of the lake: it consists of seven terraces, planted with myrtles, oleanders, laurels, and many other ornamental trees and shrubs. "The *Isola Bella* is loaded with artificial ornaments. It contains a handsome palace of four stories, which lies near the shore, and is occupied, for some months in the year by the Count *Borromeo*. By means of the *Grotte Terrene*, it communicates with the gardens, which are laid out in the French taste, upon ten terraces, rising above each other, and narrowing in proportion to their elevation. The whole has the appearance of a truncated pyramid, on the top of which stands a colossal unicorn,

the armorial ensign of the Borromei. Orange, citron, and lemon trees, united by fine hedges, or forming arbours, breathe their fragrance; lofty laurels form a little grove; myrtles and cypress are to be seen, together with pomegranate trees, the fruit of which ripens here; for the mountains which crown the lake serve as a shelter against the cold winds." The perpendicular height of the ten terraces is more than 200 feet above the level of the water of the lake, and they decrease proportionably in their circuit as they rise, till they reach the top of the hill, where they end in an oblong area paved with fine stone, in the centre of which is the unicorn, and which is surrounded by a balustrade. From this area a fine prospect of the lake and the surrounding mountains is obtained.

CHAPTER III.

RIVERS.

A RIVER is a current of fresh water, flowing in a bed or channel, from its source to the sea, or to some lake or larger river, in which it loses itself. Rivers generally rise from small fountains or springs, which bubble out of the ground, and which gain strength as they advance; or they flow from some lake, of which they form the outlet. In some cases they increase gradually by the addition of other rivers, which they receive in their course; but in others, they are swelled suddenly by the fall of periodical rains, or the melting of collected snow, as is the case with

the Nile, the Ganges, and other rivers; which, when this rapid increase takes place, overflow their banks, and inundate the surrounding country. In some few cases, rivers rush at once out of the earth in all their force, but when this is the case, it is no doubt a subterranean river which rises suddenly to the surface. It is obvious that as rivers run through a great extent of country they can only be well known when the country through which they take their course has been fully explored; and hence, comparatively, little is known of some of the largest rivers of Africa and Asia. When rivers empty themselves into the ocean, a fearful conflict frequently appears to take place between the waves of the sea and the immense body of fresh water rushing down the river; and this struggle, which is generally called the bore, is, in some rivers, as for example those of India and of South America, terrifically grand, though of course its extent depends greatly on the velocity of the river, as well as its size. Many large rivers do not empty themselves into the sea through one mouth, but divide into two or more streams, enclosing a piece of land, which, from its triangular shape, is generally called the Delta, the Greek letter of that name having a triangular form. Some rivers end in lakes, while others pass through lakes, resuming their original appearance on the other side, and sometimes without mixing their waters.

AMERICAN RIVERS.

Most of the American rivers are of enormous size, particularly those of South America. Even in North

America the Mississippi is navigable for boats from the sea to the falls of its principal branch, the Missouri; that is, 1,700 miles from the Mexican Gulf in a direct line, or 3,900 miles by the windings of the stream. Numerous other larger rivers, including the Ohio, run into the Mississippi, and as these rivers branch considerably, the whole amount of boat navigation afforded by the system of rivers of which the Mississippi is the main trunk, has been estimated at 35,000 miles. It is supposed that notwithstanding the immense quantity of fresh water collected by these rivers and poured into the sea, there is no bore; and the tide does not ascend the river at all, probably because it does not discharge itself into the sea by a single mouth, but by a kind of delta. The inundations of the Lower Mississippi are at their height in June, when the waters, 1000 miles from the sea, attain a rise of fifty feet. In the Lower Mississippi, and in the adjoining rivers, are found enormous rafts of drift-wood, formed during the river floods, which sometimes extend for ten or twelve miles in one mass, rising and falling with the stream, and yet having a luxuriant vegetation in summer.

The St. Lawrence flows from Lake Ontario, and has a course of upwards of 1000 miles, but it is only navigable for large ships as high as Quebec, about 400 miles from its mouth. The Hudson, the Delaware, the Susquehanna, and the Schuylkill, are all celebrated rivers of North America; as is the Oregon, otherwise called the Colombia, or River of the West.

The rivers of South America are also of enormous size, particularly the Orinoco and the Amazon. The latter is upwards of 4,000 miles long, and the tides

are sensibly felt about 600 miles from its mouth. This river has been found to be more than 620 feet deep, at above a thousand miles from the sea; and it is supposed to be from the depth of this mighty river at its mouth that the salt water is forced so far up. It takes its source partly from the Andes and partly from a lake in Peru, and it empties itself into the Atlantic under the equator, its mouth being 120 miles across. It receives in its course the waters of about 200 rivers, some of them as large as the Danube. Its banks are "clothed with dense and impenetrable woods, which afford a haunt to tigers, bears, leopards, wild boars, and a great variety of venomous serpents; they also abound in birds of the most beautiful plumage, and apes of the most fantastic appearance. The waters swarm with alligators, turtles, and a great variety of fish." Among the vegetable productions of the country, may be mentioned pine-apples, which grow wild in great abundance on the banks. In the rainy season the river overflows, and fertilises the adjacent country. The river was first discovered by Francis d'Orellana, from whom it is sometimes called the Orellana, but he called it the river of the Amazons, from having met with some armed women on its banks. The river is also sometimes called by its Indian name of Marañon. Its current is very rapid and violent. The enormous quantity of water discharged by the river Amazon, discolours the ocean to the distance of 300 miles from the American coast; and fresh water may be obtained from the surface of this current, at a great distance from the shore. This river alone discharges a greater quantity of water than the eight principal

rivers of Asia, including the Euphrates, the Indus, the Ganges, and the two great rivers of China. "At its mouth, two days before and after the full moon, the phenomenon called a *bore* occurs in a very formidable shape: it is a wave of water rushing from the sea, with its front as steep as a wall and as high as a house," and this is met by a rush of water of similar height and force from the river. No small vessel can encounter the concussion of the two waters without certain destruction.

The Orinoco is another very large river of South America. It is supposed to take its source in the small lake Ypava, and, after a course of about 1500 miles, it empties itself into the Atlantic by about fifty mouths, seven of which are navigable. During the rainy season, it inundates the immense plains through which it flows, the inundation extending from eighty to ninety miles on each side; and thus, as the river itself is very wide, the country presents to the eye what appears to be a boundless expanse of water. Part of the river runs through one of the Cordilleras of the Andes, whence it falls in magnificent cataracts. A few miles below this, the river divides into two arms, one of which, after a rapid course of nearly 100 miles, joins the Rio Negro, thus forming a natural water communication between the Orinoco and the Amazon, into which latter river the Rio Negro falls. The principal mouth of the Orinoco, which is just opposite the island of Trinidad, is only eighteen miles across; but, as the river is exceedingly deep, such an immense body of water is poured into the sea, that one of the early voyagers, who describes it, compares it to a torrent pouring from a water-spout. This

immense body of water rushes into the ocean with such impetuous force, that when it meets the tide, which on that coast rises to a tremendous height, the collision of the waters of the river and the ocean occasions a swell and agitation perfectly terrific. When Columbus, on his third voyage, having taken a more southern course than he had pursued in his former ones, reached the Island of Trinidad, the swell occasioned by the waters of the Orinoco pouring into the ocean was so great, that his ships were exposed to extreme danger, and he had so much difficulty in leading them safely through the strait which separates the island from the continent, that he called the strait the Dragon's Mouth. However, this circumstance led to the discovery of South America, as Columbus justly concluded that such an immense body of water must flow through a country of very great extent; he, therefore, felt certain that he had at last discovered the continent he was in search of, and steering to the west, he soon found land.

ASIATIC RIVERS.

THE Ganges is the largest river of India, and its length exceeds 1400 miles. It springs from the Himalaya Mountains, but as the exact spot where it rises was not known, Captains Hodgson and Herbert visited these mountains in August, 1818, to search for the sources of the sacred river. After ascending to the height of 13,000 feet, they arrived at a piece of level ground, whence three peaks rose about 9000 feet higher. Here they appear to have been wonderfully struck with the grandeur of the scene, as the peaks were cased in snow

from the base to the summit. They continued their ascent up the highest ; and, at the distance of about 800 feet, the travellers found one of the sources of the Ganges issuing from under a very low arch, from which great hoary icicles depended, at the foot of the great snow-bed, here about 300 feet in thickness. This spring is called Yamuna, and its overflowing forms a lake, surrounded by the high peaks of the mountain, which the Hindoos consider sacred, as they say that there the goddess Yamuna holds her secret abode, which no pilgrim dares approach without undergoing a long preparation of penances and prayer. The two other sources are called Bhagiruttee, and had been before traced as far as possible by Captains Raper and Hearsay. The first of these rivers was represented by the Hindoos to issue from a chasm or cavern in the mountains, which was called the cow's mouth, from its shape ; and this cavern was called Gangoutri. Other accounts stated the source of the Ganges to be in a lake considerably to the eastward of the cow's mouth, and the cavern so designated was reported to be a natural tunnel, which perforated the great chain of mountains. Captains Raper and Hearsay, with great difficulty and fatigue, approached near enough to Gangoutri to enable them to conclude, from the contraction of the stream and the unbroken sides of the mountains, that there could be no doubt the source of the river was situated in the snowy range. Not quite satisfied, however, with this conclusion, they dispatched one of the Fakirs to the mountain for them,—knowing that these fanatics of India “deem a pilgrimage to Gangoutri to have the effect of redeeming the person performing it from all the troubles of this life, and of ensuring him a happy passage through all

the stages of transmigration which he is destined to undergo in another,"—to push his inquiries farther into the mountains. This man reported, on his return, that, a few miles beyond Gangoutri, the river was lost under vast beds of snow, and that a rock in the midst of the rushing stream resembled the body and head of a cow; and here the valley was terminated by the steep and wall-sided mountain. The party next set out in order to trace the other great stream of the Ganges, the Alkananda, and "succeeded in reaching a spot four or five miles beyond the temple of Bhadrinath, where the stream was narrowed to eighteen or twenty feet, and where the north faces of the mountains were completely covered with snow from the summit to the base. A little way beyond this place was a cascade, where the Alkananda was entirely concealed under immense heaps of snow, beyond which no traveller has been known to pass." The river Ganges is considered holy by the Hindoos, and they believe that the surest way to Heaven is through its waters. "Hence, whenever it is possible, the Hindoo comes to its banks to die, and piously drowns in it his parents and relations, to secure their eternal happiness." With the converse of the feeling of the Gheber, who would consider the eternal fire, which is the object of his worship, polluted by the touch of a corpse, the Hindoo casts his dead, naked, into the sacred stream; "so that those who sail upon the Ganges, have often to make their way through shoals of livid corpses, floating down to the sea, in various stages of corruption."

The Ganges overflows its banks annually, and its inundations fertilise the surrounding country. Travelling is at this season performed in boats, in which the

Hindoo skims over his rice fields and gardens, which appear to the stranger's eye swallowed up in one vast but monotonous lake. When the waters subside, the appearance is at first so desolate that the crops appear to be entirely destroyed, but they soon recover themselves, and the country becomes excessively fertile. At the distance of about 200 miles from the sea the river separates into two branches, and the western branch, which is the principal one, assumes the name of Hoogly.

Both rivers are partially choked up by bars or sandbanks, arising from the violence of the bore.

AFRICAN RIVERS.

THE Nile is decidedly the most important river of Africa; and it is called in the Abyssinian tongue the father of the waters. It rises in what are called the Mountains of the Moon in Upper Æthiopia, and flows into the Mediterranean Sea by seven channels, only two of which are at present navigable. The ancients were entirely ignorant of the source of this river, and it was only discovered towards the close of the last century. It enters the lake of Dambia in Abyssinia, and crosses one of its extremities with such extreme rapidity, that its waters may be distinguished through a progress of eighteen miles which it makes through the lake. About fifteen miles after it has passed this lake, it forms a magnificent cascade, by rushing precipitately from the summit of a high rock. The greater part of Lower Egypt is included in the Delta of the Nile; the triangle being formed by the Mediterranean Sea on the one side, and on the others by the two great branches of the Nile, which divide five or six miles below Old Cairo, and fall

into the sea, the one at Damietta, and the other at Rosetta. The water of the Nile is thick and muddy, and thus, when the river overflows its banks, a fertilising slime is deposited on the fields; and as rain very seldom falls in Egypt, the inundations of the Nile are welcomed in that country as the greatest blessing the inhabitants can enjoy. The Nile has one rather remarkable peculiarity, which is, that in a course of upwards of 1300 miles it does not receive one single tributary stream; a fact which, as Humboldt observes, is quite unprecedented in the history of rivers.

The Niger, or, more properly, the Quorra, is the second great river in Africa, and it is supposed that its extent is upwards of 3000 miles; for several hundred miles of which it forms a broad and magnificent expanse, resembling an inland sea. The history of this river was long involved in the greatest obscurity, some geographers confounding it with the Nile, and others with the Senegal; the latter, indeed, was long believed to be the Niger or Black River of the ancients, from the popular name of the Senegal among the negroes signifying black. After innumerable difficulties the course of the Niger has been at length traced by two young men of the name of Lander; and the Niger has been found to be the same as the Quorra, or Joliba, which is believed to take its rise in the eastern portion of the mountains of the Moon. The Quorra forms a broad and noble stream, varying from one to six or eight miles in breadth, and passing through a large lake called Tshad; though, according to some writers, it is only one of the tributary branches of the Quorra which passes through this lake. The most remarkable part of the river, however, appears

to be the enormous extent of its delta. "Along the whole coast, from the river of Formosa, or Benin, to that of Old Calabar, about 300 miles in length, there open into the Atlantic its successive estuaries, which navigators have scarcely been able to number. Taking this coast as the base of the triangle or delta, and its vertex at Kirree, about 170 miles inland, where the Formosa branch separates, we have a space of upwards of 25,000 square miles, equal to the half of England. Had this delta, like that of the Nile, been subject only to temporary inundations, leaving behind a layer of fertilising slime, it would have formed the most fruitful region on the earth, and might have been almost the granary of a continent. But unfortunately the Niger rolls down its waters in such excessive abundance as to convert the whole country into a huge and dreary swamp, covered with dense forests of mangrove and other trees of spreading and luxuriant foliage. The equatorial sun, with its fiercest rays, cannot penetrate these dark recesses; and it only exhales from them pestilential vapours, which render this coast the theatre of more fatal epidemic diseases than any other, even of Western Africa." These broad estuaries of the Quorra communicate with each other by creeks; and these numerous creeks, which frequently overflow their banks, appear to be the true cause of the country becoming a vast alluvial morass, which extends from the coast for more than twenty miles inland.

The Senegal, which was formerly supposed to be the same as the Niger, is now found to be of comparatively little importance; as its navigation is extremely difficult and dangerous, especially in the rainy

season, when the prodigious swell of the river, from the south west winds being opposed to its rapid course, raises the waves to such a prodigious height at the mouth, where there is a formidable sand bank or bar, that their crashing at the bar resembles the shock of two mountains thrown violently against each other. Enormous trees and pieces of rock are also frequently brought down by the current, so that it is scarcely possible for any ship to enter the river with safety. About sixty miles from the mouth also, there are dangerous cataracts, so that the river is comparatively of little use for the purposes of navigation, though it is in many places of considerable depth and breadth; and its course, which, however, winds exceedingly, is nearly 800 miles in length.

The Gambier and Rio Grande are two other African rivers, which were formerly supposed to be mouths of the Niger. The sources of these rivers are regarded with great superstition by the natives, who believe that if any one attempts to leap over either stream near its source, they must inevitably fall into the water and be drowned, however narrow the stream may be; and that as the woods which surround the spring are inhabited by spirits, if any one presumes to use an axe in them, he will immediately lose the use of his arm.

EUROPEAN RIVERS.

The Danube is the principal river of Germany. It takes its rise in the Black Forest, and after a rapid course of nearly 2000 miles, it discharges itself into the Black Sea, after receiving in its course thirty

navigable rivers, and ninety smaller streams. The Danube was formerly considered unnavigable from its numerous cataracts, but this difficulty having been overcome, partly through the exertions of a patriotic Hungarian nobleman, steam-vessels are now established between Pesth and Constantinople. One of the most remarkable parts of this river is, what was formerly called the Gate of the Danube. Near the little village of Grein, the river contracts suddenly, so as to be only one fourth of its former width, while the mountains on either side becoming higher and higher, the channel of the river presents the appearance of a mountain gorge or defile, and this was almost impassable, as will be seen by the following description of what it was only a few years ago. "The dark and gloomy forests, extending from the mountain-tops down to the water's edge; the castles surmounting the banks on either side; and the violent course of the river,—all conspire to produce a grand and picturesque scene. This gorge or defile terminates at an island which occupies the centre of the river, dividing it into two branches, of which one only is capable of being navigated with safety. Even this one branch is a channel of no inconsiderable danger, for across it stretches a reef of small rocks, known by the name of the *Strudel*, over which a boat is hurried with fearful velocity. No sooner is this danger past, than the traveller sees before him another small island or rock in the middle of the river; so situated as to cause a boiling and foaming whirlpool, called the *Wirbel*, in the stream. The current here flows in all directions at once; insomuch that an eddy, twenty or thirty feet over, is formed, concave in appearance, and

'sunk three or four feet in the middle." The rocks are now partly removed, and the passage rendered safe.

The Rhine is celebrated for the romantic beauty of the scenery. It rises in the Alps, three separate streamlets uniting to form the river. Its course is about 900 miles, through a country remarkable for the beauty of the scenery; but, singularly enough, it does not empty itself naturally into the sea, as it formerly disappeared in some downs near Leyden; and even now it is only conducted by a canal from Leyden to the ocean. Another branch, which divides from the main stream near Utrecht, empties itself into the Zuyder-Zee. The Rhine in its course passes through the Lake of Constance, and divides several times, forming large branches which empty themselves into other rivers, particularly the Meuse. When the snow melts in Switzerland, the Rhine rises from twelve to thirteen feet above its common level, and frequently inundates the surrounding country, occasioning, when it does so, dreadful devastation, as it generally covers the adjoining fields with sand. One of the singularities of the Rhine is, that particles of gold are found in the sand which is brought down by the river from the mountains, but these particles are so small, that in the space of four miles scarcely five ounces are collected in the year. The river also contains many crystals and agates, the latter of which are known by the name of Rhine pebbles.

The Rhône also takes its rise in the Alps, and its source is only five miles from one of the sources of the Rhine. It flows in a western direction through the wide valley of the Swiss Canton of the Valais, and after a course of about 500 miles, during which it is joined by several other rivers, it empties itself by

three mouths into the Mediterranean Sea, in the part called the Gulf of Lyons; its branches forming the Island of Camargne. The Rhone carries with it great quantities of earth which it deposits at its mouth, and hence the navigation of the river is very hazardous, as the outlets through which the river empties itself are continually changing their shape, sometimes one being passable, which, in a few days, is nearly closed, and another is opened. "To remedy this inconvenience, a canal has been opened from Arles to the small haven of Bouc, near the sea." There is also a navigable river which connects the Rhine and the Rhone. The most remarkable circumstance connected with the Rhone is, however, its disappearance near Bellegarde, where it plunges with great noise into a cavity of the rocks, and does not shew itself again for a distance of about 120 yards. The width of the river, which when it quits the Lake of Geneva is about 115 feet, is contracted, just before it loses itself, to about sixteen feet. This curious phenomenon, which is called *La Perte du Rhone*, is almost repeated a few miles lower down near Mal Pertuis.

The river Guadiana in Spain loses itself nearly in the same manner as the Rhone, at about twenty five miles from its source, near the village of Castillo de Cervera, it disappears under the earth; and rises again nearly twenty miles from the place of its disappearance, at the spot called by the Spaniards the Eyes of the Guadiana. The whole course of the river is more than 300 miles. Several rivers in Greece have an underground course in a similar manner.

Among the principal rivers of Italy is the Tiber, which issues from the Apennine Mountains at a short

distance from Rome, and empties itself into the Tuscan Sea. The water of this river is so muddy that horses will not drink it; and even the poets, describing the river, call it the golden Tiber, in allusion to the yellow clay with which its waters are saturated. After standing a few hours, however, the water of the Tiber becomes clear and fit to drink. "The bed of this river having been raised by the ruins of the many edifices which have fallen into it, and its mouth partially choked up, it frequently overflows its banks, more particularly during the prevalence of a strong south wind."

CHAPTER IV.

SPRINGS.

As springs are the sources of rivers, it would have been scarcely necessary to speak of them under a separate head had there not been some cases in which springs are celebrated quite independently of the river which springs from them; others in which the springs, though of considerable importance in themselves, do not give birth to any river; and others in which the springs are celebrated for some quality which they possess, such as mineral springs, or springs of warm water.

SPRINGS REMARKABLE FOR THEIR SIZE.

ONE of the most magnificent springs in Europe is that of Petrarch's fountain at Vacluse near Avignon. "It rises within a cavern, at the foot of a vast semi-

circular precipice of compact limestone terminating a wild valley. In the beginning of autumn, by clambering over a heap of rubbish, the traveller may descend into the cavern, and will find himself on the brink of a gulf of the clearest water, of unfathomable depth, with the deep blue tint of the ocean out of soundings, rising with great force, and an unruffled surface, from the recesses of the mountain. It issues from the cavern through concealed channels, and forms at once the river Sorgue, capable at its very source of moving machinery, and almost immediately navigable for boats. The waters of this extraordinary spring never vary half a degree in temperature. When the melting of snow on the neighbouring Alps increases its sources, the cavern is entirely filled with water, and the stream rushes over the rugged bank at the mouth of the cavern with the tumult of a cascade."

The largest spring in Great Britain is St. Winifred's Well in Flintshire. This spring, which has almost the force of a subterranean river, produces about twenty-one tons of water a minute; and the water which passes through the town of Holywell, runs with such force, as to turn several mills. A chapel has been built over the spring, on the windows of which are painted the chief events in the life of the saint. A peculiar kind of lichen grows in the walls of the well, which, in the days of superstition, was believed to be St. Winifred's hair; and as some of the same lichen, which looks red when wet, was found on the stones at the bottom of the well, it was said to be the saint's blood.

INTERMITTENT SPRINGS.

ONE of the most remarkable of these is at Bolder-Born in Westphalia. After flowing for twenty-four hours, it entirely ceases for the space of six hours. It then returns with a loud noise, in a stream sufficiently powerful to turn three mills very near its source. Another spring of the same nature occurs at Bihar in Hungary, which issues many times a day, from the foot of a mountain, in such a quantity as in a few minutes to fill the channel of a considerable stream.

The Lay Well near Torbay, ebbs and flows sixteen times in an hour; and in Giggleswick Well in Yorkshire, the water sometimes rises and falls in ten or fifteen minutes.

St. Anthony's Well, on Arthur's Seat, near Edinburgh, has a similar movement, but on a smaller scale.

In Savoy, near the lake of Bourget, is another spring of this kind, but it differs from those which have been already mentioned in being very uncertain in its intervals.

MINERAL SPRINGS.

ALL spring water contains a certain proportion of air, and of mineral substances; but when these latter exceed a certain proportion, the spring is said to be a mineral one. Mineral waters are of four kinds:—acidulous, chalybeate, sulphureous, and saline. The first generally abound in carbonic acid, and have a sparkling appearance and an agreeable taste. Of this kind are the Seltzer and Spa waters in Germany, and the Tonbridge waters in England; the latter, how-

ever, being less agreeable than the former, as they are impregnated with iron. The chalybeate springs all contain either the carbonate or sulphate of iron; and in some of them one or two grains are found of oxide of iron combined with other salts. There are various chalybeate springs in England; and in some places there are chalybeate springs in addition to those which have given their principal celebrity to the place, as for example, there are chalybeate springs at Buxton, Harrowgate, and Cheltenham, in addition to others of quite a different nature. Chalybeate springs are considered strengthening, but they are injurious when taken by persons of an inflammatory habit. The sulphureous waters owe their qualities to sulphuretted hydrogen, and are extremely disagreeable both in taste and smell. The principal ones in England are those at Harrowgate and Leamington. The waters at Kilburn, near London, on the Edgware road, which were formerly celebrated, were of this kind. At Wigan, in Lancashire, there is a sulphureous spring, the waters of which burn like oil. On applying a lighted candle to the surface a large flame is produced which burns vigorously, though the water itself is quite cold; and the earth which has been wet by the water, and has become dry, will burn also in the same manner.

At Broseley in Shropshire, in the month of June, 1711, a boiling spring was discovered under a small hill about 200 yards from the river Severn. It was announced by a tremendous noise in the middle of the night, and which was described by those who heard it, as sounding as if there were a thunder storm under ground. Some persons who lived in the neighbourhood had the curiosity to go to the spot from which the noise proceeded,

when they found an extraordinary commotion and shaking of the earth, with a little bubbling up of water through the grass. One of the party had the courage to take a spade, and to force it into the ground, when the water immediately flew up to a great height, and was set on fire by a candle which was held by one of the work-people. It was found, however, on further examination, that the water was perfectly cold, and that though it burnt fiercely when set on fire it soon went out.

The saline springs are very numerous, but the most celebrated are those at Cheltenham, Leamington, and Epsom. Seidlitz springs are of this nature. They are all rather unpleasant in taste, but have very little smell.

The dropping well or petrifying spring at Knaresborough rises at the foot of a limestone rock near the bank of the river Nidd. "The spring, after running about sixty feet, divides, and spreads itself over the top of the rock, whence it trickles down, from thirty or forty places, into a channel hollowed for the purpose, each drop producing a musical kind of tinkling, probably owing to the concavity of the rock, which, bending in a circular projection, from the bottom to the top, occasions its brow to overhang about fifteen feet." The water contains nitrous earth, which it deposits upon any object placed within reach of its waters, dropping very slowly, so as to incrust the leaves, moss, &c., which it meets with; and as objects thus incrustated resemble stone, they are said to be petrified. The persons who shew the well have several curious objects thus incrustated, which they exhibit, and amongst other things an old wig and a bird's nest, which look as if they were really turned into stone.

HOT SPRINGS.

THE most celebrated hot springs of England are those at Bath, which are acidulous, and the heat of which is 116° where they issue from the earth. The hot springs at Bristol, Buxton, and Matlock, are of the same nature, but of a much lower temperature, those at Buxton, which are the warmest of the three, not exceeding 82° , and those at Matlock being only 66° . One of the warmest springs used for a bath is that at Carlsbad, where the waters are 167° . The waters are also very warm at Aix-la-Chapelle, and as they are sulphureous, their smell is intolerable. The most extraordinary hot springs in the world, however, are the Geysers of Iceland, and another boiling spring in the same island, which issues from a small mass of rock, in the midst of a large river. The Geysers are celebrated for their intermissions, and for the magnificent jets of boiling water which they throw out. Two of the largest of these fountains are in a valley about sixteen miles from Skalholt. In the middle of this valley is a little mount, six or seven feet high, in the centre of which is a circular basin, from fifty to sixty feet in diameter, and about three feet deep. In the centre of this basin is a round hole about ten feet wide, which is the mouth of a natural pipe or funnel which sinks into the earth to the depth of nearly eighty feet. By this pipe, the water occasionally retires, leaving the basin quite dry; but at regular intervals, which differ in the different fountains, the water begins to bubble up till it has gradually filled the basin, even to overflowing, and as soon as it has done so, the ground is shaken by hollow

subterraneous convulsions, and "suddenly a prodigious column of boiling water is shot into the air with astonishing violence, and clouds of steam obscure the atmosphere. This is followed by successive jets, sometimes to the number of sixteen or eighteen in five minutes." The heights to which the jets rise are from ninety to 212 feet, the latter being the height of one measured by Lieutenant Ohlsen in 1804. These hot water springs appear evidently of volcanic origin, and whenever an earthquake shakes the island it is sure to be attended by the formation of fresh boiling springs. The waters of the great Geyser hold an immense quantity of flinty matter in solution, and where they overflow the basin, they deposit a stony crust upon the adjacent plants. The jets "are attended with a loud noise, and the ground trembles beneath the feet, whilst the velocity with which the jets and the accompanying steam are hurled into the air is astonishingly sublime. When stones are thrown into the pipe, they remain there until the succeeding jet projects them with great violence into the air, and they may be seen descending amid showers of boiling water."

Besides these very remarkable fountains, hot water springs have been discovered in various parts of the world, and amongst other places at St. Michael's in one of the Azores, where the water is of such an intense heat that it will boil an egg.

The boiling spring at Solfatara near Naples is another example, and many others might be mentioned; but in most cases the wonder is somewhat diminished by the circumstance of the spring being evidently connected with a volcano, and thus the hot springs in

England may be said to be the most wonderful in the world as there is no volcano near them.

In New Zealand, near the volcano of Tongariro, boiling springs burst out of the ground, which are thus described by Mr. Angas. "The crater of Tongariro is an immense truncated cone, giving vent, like an enormous safety-valve, to the steam and vapours that proceed from the boiling waters in its subterranean depths. Several other mountains are grouped with the stupendous peak of Tongariro, forming one grand mass or cluster; and the snow extends for a considerable distance down their sides. Near the termination of the snow there are boiling springs, which send up volumes of steam. Forests clothe the lower sides for some miles, and fern hills commence the ascent. It is only at intervals that any considerable quantity of steam issues from the crater. When I first saw the mountain from across the lake, there was no appearance of vapour, but after sunset it rose in continuous masses. The lake Roto-aira is upwards of 2,000 feet above the level of the sea, and there are numerous snow-fields and glaciers in the immediate neighbourhood" Nearly 100 boiling springs issue from the side of a steep mountain above Te Rapa. "They burst out, bubbling up from little orifices in the ground, which are not more than a few inches in diameter, and the steam rushes out in clouds with considerable force: the hill-side is covered with them, and a river of hot water runs down into the lake. The soil around is a red and white clay, strongly impregnated with sulphur and hydrogen gas: pyrites also occur. Several women were busy cooking baskets of potatoes over some of the smaller orifices; leaves

and fern were laid over the holes, upon which the food was placed: I tasted some of the potatoes and they were capitally done." "About two miles from this place," Mr. Angas continues, "on the edge of a great swampy flat, I met with a number of boiling ponds; some of them of very large dimensions. We forded a river flowing swiftly towards the lake, which is fed by the snows melting in the valleys of the Tongariro. In many places in the bed of this river, the water boils up from the subterranean springs beneath, suddenly changing the temperature of the stream, to the imminent risk of the individual who may be crossing. Along whole tracts of ground I heard the water boiling violently beneath the crust over which I was treading. It is very dangerous travelling, for if the crust should break, scalding to death must ensue. I am told that the Roturna natives, who build their houses over the hot springs in that district, for the sake of constant warmth at night, frequently meet with fatal accidents of this kind; it has happened that when a party have been dancing on the floor, the crust has given way, and the convivial assembly have been suddenly swallowed up in the boiling cauldron beneath. Some of the ponds are ninety feet in circumference, filled with transparent pale blue boiling water, sending up columns of steam. Channels of boiling water run along the ground in every direction, and the surface of this calcareous flat around the margin of the boiling ponds is covered with beautiful incrustations of lime and alum, in some parts forming flat saucer-like figures. Husks of maize, moss, and branches of vegetable substances were incrustated in the same manner. I also observed small deep holes, or wells, here and there amongst the grass

and rushes, from two inches to as many feet in diameter, filled with boiling mud, that rises up in large bubbles, as thick as hasty pudding: these mud pits send up a strong sulphureous smell. Although the ponds boiled violently, I noticed small flies walking swiftly, or rather running on their surface. The steam that rises from these boiling springs is visible at a distance of many miles, appearing like the jets from a number of steam engines."

At the distance of some miles from the volcanic mountain, lumps of pumice stone are seen floating down the river Waikato.

In addition to the hot springs may be mentioned those which appear to be constantly boiling, though, in fact, the water remains quite cold. Of this nature is the boiling spring at Peroul, near Montpellier, which is observed to heave, and apparently to boil up very furiously in small bubbles, but the water of which remains perfectly cool. What is called the mud lake of Java is another of these springs, but rising in a quagmire its bubbles are formed of mud, which, as they burst, throw up two or three tons of mud at a time, and immense volumes of dense white smoke.

CHAPTER V.

WATERFALLS AND WHIRLPOOLS.

WATERFALLS are of various kinds; and the most simple are when a series of sudden declivities occur in the bed of a river. These slight declivities, which are

frequent in the rivers of America, are called rapids; and as they generally give additional impetus to the stream, they are reckoned favourable situations for erecting mills. They also form only a slight impediment to navigation. A cataract, on the contrary, stops navigation, as it implies the fall of a whole river down a precipice, where, of course, a boat would be dashed to pieces. When the water falls from rock to rock in a succession of small cataracts it is called a cascade.

One of the noblest cataracts in the world is that at Niagara, in Upper Canada. It has been before mentioned that the five large lakes of Upper Canada are united so as to run one into the other, and in this manner Lake Erie is united to Lake Ontario, the lowest of the five, by the river Niagara. This river, which is extremely rapid, and 1650 feet in width, precipitates itself in its course over a rock, or rather precipice, 160 feet in perpendicular height. The whole river, in its course from one lake to the other, is between thirty and forty miles in length; and about one mile above the falls its banks rise about a hundred feet from the water. At the grand falls the river is three-quarters of a mile broad, and the precipice curves nearly in a semicircle extending in the longest line on the American or eastern side. An island, called Goat Island, divides the cataract into two principal portions, viz. the American fall on the east, and the Horse-shoe fall on the west, or Canada side. A portion of the fall on the American side is cut off by a small island on the precipice; but the rest descends in one body, almost perpendicularly, from a height of 164 feet, and is 1000 feet in width. Both the falls on the American side are crossed by bridges. The Horse-shoe fall is fourteen

feet less in height, but surpasses the other much in grandeur. The great body of the water passes the precipice with such force that it forms a curled sheet, which strikes the water below, fifty feet from the base of the precipice, so that visitors can pass behind the sheet of water without being wet. The best view of this cataract is from what is called Table rock ; and it is frequently adorned with a rainbow. Sometimes, indeed, three rainbows are seen in the clouds of spray, which rise 100 feet above the precipice.

There are many other falls in North America, the principal of which are the following : the Falls of Montmorency, where the river forms a cataract 250 feet in height, and fifty feet in breadth. These falls are nine miles below Quebec. The falls of the Mississippi, where the river forms a cataract forty feet in height, just above its junction with the Ohio. The height of this cataract is not great, but its effect is striking, from the surrounding country being level, and the river 700 feet in width. The Missouri, at a distance of 500 miles from its sources, descends 360 feet in eighteen miles. There are three principal cataracts, one of eighty-seven, one of forty-seven, and one of twenty-six feet in height. The river is 1000 feet broad, and the whole scene is described as extremely beautiful, and, indeed, only surpassed by the falls of Niagara. The falls of Passaic in New Jersey, though not so well known as the others, are described as being very beautiful, as the river, which is 150 feet wide, falls in one entire sheet into a chasm seventy feet deep.

The falls in South America are remarkable for their grandeur, but perhaps the finest of them all is the cataract of Tequendama on the river Bogota in Colum-

bia. The river rises in a lofty plain, 9000 feet above the level of the sea, and it is precipitated into the lower country through deep ravines, and over steep precipices till at last it plunges into a chasm 600 feet in depth.

The cataracts in Asia are not so well known as those of America, but the finest appears to be that of the river Shirawati, in the Indian province of Canara, which exceeds in beauty and sublimity every waterfall which has been hitherto made known in Europe. "The country around the village of Haliali, about three miles north-west of the fall, presents the richness of a tropical forest, mingled with cultivation. The traveller comes suddenly on the river. 'A few steps more,' says Dr. Christie, 'over huge blocks of granite, bring you to the brink of a fearful chasm, rocky, bare, and black, down into which you look to the depth of 1000 feet.' The bed of the river is one fourth of a mile broad, in a direct line; but the edge of the fall is elliptical, with a sweep of about half-a-mile. The body of water rushes at first for about 300 feet over a slope at an angle of 45° , in a sheet of white foam, and is then precipitated to the depth of 850 feet more, into a black abyss, with a thundering noise. It has, therefore, a depth of 1150 feet. In the rainy season the river appears to be about thirty feet in depth at the fall; in the dry season it is much lower, and is divided into three cascades of varied beauty and astonishing grandeur; but the smaller streams are almost dissipated in vapour before they reach the bottom."

Europe is celebrated for its cataracts. The torrents are seldom of great size, but the rocky beds over which they dash with foam and spray, and the dark glens

into which they rush, make them often produce the most awful emotions. In northern Europe, one of the most considerable falls that has yet been discovered is that of the river Lattin, in Swedish Lapland. The river is half a mile in length, and the fall four hundred feet in height. In Norway is the celebrated smoking cataract called the Riukand, which is situated at the extremity of a valley enclosed between lofty mountains. At the distance of about five English miles up this valley, a smoke or vapour is perceived rising up among the wild blackish grey mountains, and which, as it alternately rises and falls, gives the idea of being the smoke rising from some stupendous cauldron. Proceeding farther the traveller arrives at the commencement of the Maristein (Mary's Path), and has a distinct view of the fall, being then opposite to it, at the distance of less than half an English mile. The Maane Elv (river) "precipitates itself down the rocks with a tremendous roar, through a cavity not more than twelve feet wide, having the appearance of a vast quantity of foam, dividing and convulsing in a great variety of forms, as it dashes headlong towards the bed of the river, which to some considerable distance is completely covered with a kind of froth, the vapour of which rises, like smoke, to a considerable height among the adjacent mountains." The height from which the water falls is about 900 feet, and the basin, or reservoir, which receives it is in the form of a wedge between two high mountains, the sides of which are naked, and apparently smooth. In winter the particles of water freeze, and form a curious kind of natural filagree work on the mountain. In Sweden, near Gottenberg, the river Gotha falls down a high precipice into a deep pit,

with a dreadful noise, and such amazing force, that if the rafts of trees which are floated down the river are permitted to fall into them they are generally dashed to pieces by the force with which they are precipitated.

In the Alps there are many celebrated falls, the principal of which are those of Mont Rosa, in the northern boundary of Piedmont. In one of these the river Orco forms a series of cascades, the height of which is estimated at 2400 feet. The torrent Evanson, which descends from another part of the same mountain, falls from a height of 1200 feet. At the Stabach, in the Canton of Berne in Switzerland, a small stream descends from the height of 1400 feet. Notwithstanding the great height of these falls, they create comparatively trifling sensation, from the narrowness of the streams and the small body of water precipitated. The cataract of Lauffen is not more than 75 feet high, but it is reckoned extremely beautiful, from the great body of water that falls, and from the picturesque manner in which it is broken into spray over the rocks.

The falls of Terni and Tivoli are the most celebrated of Italy. Those at Terni fall down a height of 300 feet into a deep basin, whence the water rebounds with a loud noise, and fills the air with spray. The falls at Tivoli are not natural, the river Anio having been led in an artificial channel for some distance till it reaches the edge of the rock, over which it precipitates itself. "The waters have made for themselves another outlet, and fall through a hole in the hill into a cavern called the Grotto of Neptune, where, as they bound from rock to rock, the sound reverberates through the arched roof of the grotto with a hoarse and almost stunning noise." The principal of these falls is about 100 feet high.

There are many falls in Great Britain, particularly in Scotland. The most celebrated of these are the Falls of the Clyde, and those of Fyers; but the largest is the Fall of Glomach in the county of Ross. At the head of a wild and solitary glen seven miles from the inn at Shealhouse, the river Girsac is precipitated in an unbroken form of more than 300 feet. At the distance of about fifty feet from the bottom, the water strikes on a shelving rock, whence it falls into a dark pool, but when the water is in flood it descends in one unbroken sheet 380 feet in height. The Falls of the Clyde are frequently called the Linns, from a Gaelic word signifying a fall of water. The first of these falls is situated about two miles above Lanark, and it is known by the name of Bonnington Linn. The river here falls over a perpendicular rock about thirty feet high, having approached its brink in a broad sheet as smooth as a mirror, which contrasts strongly with the impetuosity of its fall, which is so great that it makes a noise like thunder, while the water rises up in clouds of foam and spray. About half a mile lower is a second fall called Corra Linn, from the castle of Corra, which stands close to the fall. The castle is now in ruins, but the estate belonging to it is in the possession of Lord Corehouse, who has built a magnificent modern house on the grounds. Corra Linn is eighty four feet in height, and though the fall is divided into three leaps, the break between them is almost imperceptible from the banks. A short distance below Corra Linn is another small fall which is only about three feet and a half high; and about three miles farther down the river is another set of falls called the Stonebyres, at which

the river leaps down a succession of three precipices, making together a height of sixty four feet. The Fall of Fyers near Loch Ness, is a vast cataract, which precipitates itself into a darksome glen of stupendous depth. "The water rushes beneath, through a narrow gap between two rocks, and thence precipitating itself more than forty feet lower into the bottom of the chasm, the foam, like a great cloud of smoke, rises and fills the air. The sides of this glen are stupendous precipices, blended with trees overhanging the water, through which, after a short space, the waters discharge themselves into the lake. About half a mile to the south of this fall is another, which passes through a narrow chasm, whose sides it has undermined for a considerable distance. Over the gap is a true alpine bridge, formed of the trunks of trees covered with sods, from the middle of which is an awful view of the water roaring beneath."

In England are several interesting waterfalls, and amongst others may be mentioned that on the river Tees in the county of Durham; the cataract of Lowdore on the Derwentwater in Cumberland, which Southey has immortalised; that of Sty Head in Borrowdale, which is about 800 feet high; and that on the river Lyd in Devonshire, which has been thus described by a traveller who had visited the spot. "Not far from Lydford is what is commonly, but erroneously, called Lyd fall, which is occasioned, not by the river, but by the collection of several rivulets above into an excavated space for the use of a mill, whose waters united into a single stream form the fall, and which are sometimes ponded back to produce a greater effect on the eye of strangers. The rock over which the waters

glide is composed of smooth schistose strata, and some way down is a projection, which causes, as it were, a second fall. At the bottom, to which there is a winding path through a wood, is a cauldron or pit, hollowed by the constant attrition. The height of the fall, or rather of the two falls, may be estimated at 110 feet. The Lyd, emerging into day from the chasm, joins the falling waters, and both flow together in a more peaceable course down the valley, the sides of which are roughened with woods and copses. The depth of the valley, and the gloom diffused by the thick woods, give solemnity to the scene, which would amply repay the traveller who may be fond of picturesque scenery, even if there were no waterfall to increase the beauty or add to the other natural attractions of the place. The Lyd likewise forces its silvery stream through the wood, and gives additional beauty to this interesting spot." "On the Lyd is another fall, called Kit or Skid fall, on a common a mile and a half from the castle. The river here bursts through steep and craggy rocks, with a descent of thirty feet, at one place losing itself beneath the stones. If surrounded by trees, it would be still more attractive than it is, but still it highly deserves a visit. Fragments of tin ore are frequently found in the channel of the Lyd."

Whirlpools are when two opposite currents of nearly equal force meet, especially in narrow channels, when they sometimes assume a spiral direction. The most celebrated whirlpool in the world is that of Maelström on the coast of Norway; but it is only at certain seasons that it is dangerous. When the flood-tide sets in from the south-west, and it meets a strong

gale from the north-west, the whirlpool is formed, and its roaring is heard at the distance of many miles. It is not only dangerous to vessels, but it is said that seals and whales, if caught in its eddies, cannot possibly escape. The water of the whirlpool is said to be forty fathoms deep; and at the ebbing of the tide its noise is as loud as a cataract. In 1645 it was so violently agitated by a storm, that some of the stones of the houses in the adjoining Isle of Moskoe were shaken out of their places, and fell to the ground. "Fragments of vessels wrecked in the Maelström are frequently seen on the coast, brought up by the return of the tide, their edges mashed and jagged as if with a saw, which would induce the belief that the bottom is composed of sharp rocks."

CHAPTER VI.

ICEBERGS AND ICEFIELDS.

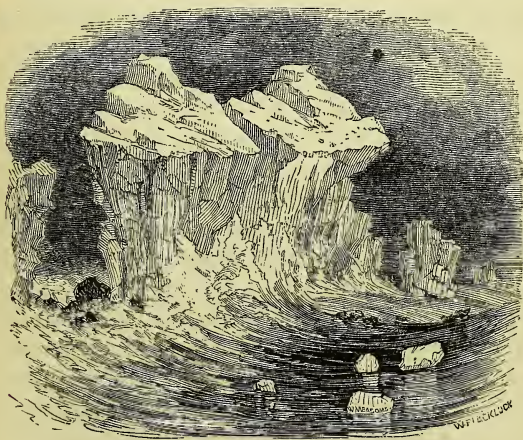
THOUGH it was formerly supposed that salt water could never freeze, it is a well known fact, that large masses of floating ice are frequently met with in the seas of the high northern latitudes. To account for this, it is said that the snow on the land adjoining the North Seas freezes till it becomes a solid mass of ice, which is continually being increased by fresh snow being deposited upon it. "When such a mass has reached the height of 1000 or 2000 feet, the accumulated weight, assisted by the action of the ocean at its base, plunges it into the sea, and it is driven

southwards by the winds and currents, and known to mariners under the name of an *iceberg*. The icebergs consist of a clear, compact, solid ice, with a bluish-green tint; and from the cavities in them, the northern whalers fill their casks with pure fresh water."

On the other hand, what is called field ice, being frozen sea-water, is porous and incompact; as it is composed of thin flakes, which contain salt within their interstices. Common water, as is known, freezes at 32°, but sea-water will not congeal till the thermometer is at 27°, that is, five degrees colder. A large expanse of saline ice is called a field, and one of smaller dimensions a floe; but when the floe ice is much broken it is denominated a pack. If a ship can sail freely through the floating pieces of ice, these pieces are called drift ice; but if they rise above the common level, and then freeze together, the mass is called a hummock. What is called the ice blink has a whitish appearance in the horizon, occasioned by fields of ice reflecting the light obliquely against the atmosphere. Very serious damage has been frequently done to ships by icebergs and fields of ice; and the appearance of icebergs and hummocks in the water has been described as most extraordinary. In some cases the hummocks are produced by two pieces of ice being driven forcibly together; so that the edges of the ice are broken, and forced upwards, though still pushing against each other, while in this position they are again frozen. When this is the case, the colours produced by the refraction of light on the ice are very striking.

The icebergs are like enormous floating hills com-

posed of rugged and steep rocks. They have been seen of various sizes, but they are generally from fifty to 120 feet above the level of the water; and, as they are of enormous width, when a current forces them against a ship, the effects are generally fatal. Sometimes the field ice is equally as injurious as the icebergs, particularly when the field of ice is what is called heavy, that is, of considerable extent; as the sharp edge of the ice, when forced by the current against a vessel, comes with such violence, as to cut through the solid timber. In April, 1841, the Great Western had considerable difficulty in extri-



ICEBERGS.

cating herself from an icefield which extended for more than 100 miles in a direction from east to west; and on the 21st of May, 1847, the packet ship *Eulalia*, while on her passage from Havannah to Galway, was overwhelmed by

an iceberg. Early in the morning she met with a heavy field of ice, which the master attempted to clear, but this was found impossible, and about nine o'clock a tremendous iceberg struck the ship amid ships, cutting her down to the water's edge. There were thirty-seven passengers, many of whom were women, on board, and a crew of sixteen persons including the master. The moment the ship was struck, the boats were lowered, and two of them, containing the captain, fourteen of the crew, and fourteen passengers, succeeded in getting clear of the wreck; but the third, with upwards of twenty persons in it, principally women, was drawn down by the vessel, and every human being perished. The boat, it appeared, was fastened to the wreck by a rope, which the crew, in their fright, fearing the ship was sinking, had forgotten to unfasten, and which it was impossible to cut, the passengers having no implement with them.

At all times the navigation among ice fields and ice floes is attended with considerable danger. "The fields frequently have a rotatory movement: which appears to be produced by the different force with which the current acts on the different sides of such a large body of ice. By this movement their outer borders acquire a velocity of several miles per hour. A field thus in motion coming in contact with another at rest, or, as it at times happens, with one which has a contrary direction of movement, produces a dreadful shock. It is easy to comprehend that a body of more than 10,000,000,000 of tons in weight, meeting with resistance when in motion, produces effects which it is scarcely possible to conceive. The weaker field is crushed with an awful noise; and sometimes the de-

struction is mutual." That a ship placed between the two fields would be destroyed, is easily to be imagined; and, in fact, numbers of whalers have been destroyed in this way. In the year 1804, Captain Scoresby met with an accident of this kind, which he has thus described in his *Account of the Arctic Regions*. "Passing between two fields of ice newly formed, about a foot in thickness, they were observed rapidly to approach each other, and before our ship could pass the strait, they met with a velocity of three or four miles per hour. The one overlaid the other, and presently covered many acres of surface. The ship proving an obstacle to the course of the ice, it was squeezed up on both sides, the blow shaking her in a dreadful manner, and producing a loud grinding or lengthened acute tremulous noise, according as the degree of pressure was diminished or increased, until it had risen as high as the deck. After about two hours the motion ceased, and soon afterwards the two sheets of ice receded from each other nearly as rapidly as they had before advanced. The ship in this case did not receive any injury, but had the ice been only half a foot thicker, she might have been wrecked." In other cases ships become surrounded by drift ice in such a manner that they can neither advance nor recede, but are literally frozen up. This has frequently happened, and is supposed by some persons even now to be the case with the expedition under Sir John Franklin. In other cases ships have been beset with ice, which has frozen round them, so that the ship has assumed the appearance of an iceberg, and has drifted with the current just as a quantity of solid ice would have done.

BOOK III.

ATMOSPHERIC PHENOMENA.

IT is a very common mistake to suppose that the whole space which intervenes between our planet and the other celestial bodies is filled with what we call the atmosphere. This is by no means the case: the atmosphere is a transparent covering which belongs to the earth and moves with it, and which has been compared to the coats of varnish laid on a common painted globe; as, though the extent of the atmosphere is supposed to be about forty-six miles from every part of the surface of the earth, this thickness is not more, when compared with the size of the globe, which is about 8000 miles in diameter, than the coats of varnish are to the artificial globe. The atmosphere, or air, which thus surrounds the globe, is an elastic fluid, capable of either compression or distension; and, as every square foot of earth has to support the weight of a column of air of the same diameter, forty-six miles in height, it is easy to imagine that the stratum of air which lies next the earth is more compressed, or, in other words, is rendered more dense than the stratum of air immediately above it; and that the strata of air will be less compressed, or, in other words, become more rarefied, in proportion as they recede from the earth, and as the column of air above each becomes shorter and

consequently lighter. Air is composed of a combination of different gases; and the air we breathe generally consists of about seventy-nine parts of nitrogen, twenty of oxygen, and one of carbonic acid. Occasionally these gases are mixed with a vapour, or steam of water rising from the earth, which consists of hydrogen and oxygen. Air possesses the property of refracting light, that is of bending it from a right line and making it move in a curve. The consequence of this is, that the sun continues visible to us a short time after it sets, and appears to us a short time before it rises; and hence also arise many other optical delusions in the atmosphere. The higher strata of air are very inflammable, and hence shooting stars, fire balls, and other meteors appear to be formed in those regions. It has been already observed that moisture is continually mixing with the air, part of which rises from the earth in the shape of vapour; and as the globules of water which thus rise have a tendency to congregate together, they form, while suspended in the air, what are called clouds; and when the water contained in these clouds becomes too heavy to be supported by the column of air beneath it, it descends upon the earth in the shape of rain. When the earth is cold, and the air surcharged with moisture, the vapour from the earth hovers on the tops of the hills, and spreads over the valleys instead of forming clouds, and when this is the case it becomes what we call a fog. When the earth is much colder than the air, the rain in descending becomes hail, and when the strata of air, through which the rain has to descend, are colder than the clouds, the rain becomes snow.

CHAPTER I.

OPTICAL PHENOMENA.

It has been already mentioned that clouds are collections of aqueous globular particles suspended in the air, and when the rays of the sun strike upon a cloud, they are partly reflected and partly absorbed by the suspended globules. Where a great quantity of water is suspended, the rays of light are proportionately absorbed, and hence the sky, when surcharged with rain, is dark, and the day looks gloomy. When, on the contrary, the clouds are thin, they reflect nearly all the rays that fall upon them, and hence, in fine weather, the clouds look white, and abundance of light is diffused through the sky. Owing to the excessive minuteness of the watery particles contained in the clouds, the rays of light which fall upon them are only reflected or absorbed by their external surface, without entering them; but when the watery particles are collected in large drops, as they are when it rains, the light enters them and becoming divided into its primitive colours, it forms what we call a rainbow. This, however, can only be seen when the sun shines upon the drops of rain which fall behind the spectator, the coloured arch being a portion of a circle, whose centre is a point in the sky directly opposite the sun. Generally the arch is less than a semicircle, but its length is in-

creased in proportion as the spectator is raised above the surface of the earth; and hence, when viewed from a very lofty situation, rainbows appear almost circular. Sometimes a secondary rainbow is perceived, but as it is produced by a double reflection, its tints are inverted, and fainter than the first; and occasionally, but rarely, a third bow may be faintly traced. Lunar rainbows are also observed occasionally, but the faintness of their colours renders them much less conspicuous than the rainbows of the sun.

Halos or rings are often seen surrounding both the sun and moon, and they are evidently caused by a very thin vapour diffused through the atmosphere, which occasions a deflection of light. It has been observed that these halos are never seen but when the atmosphere is surcharged with moisture; and hence it is a common popular saying, that a dense halo round the moon portends rain.

The parhelia consists of two or more mock suns, which are frequently seen in the Arctic regions, and are occasioned by the refraction of light from the snowy spiculæ constantly floating in the air. The parhelia sometimes presents a gorgeous appearance of intersecting luminous arches studded with numerous images of the sun, and it is described as being one of the most splendid of all the atmospheric phenomena.

Another most remarkable optical deception, called the mirage, occurs in the atmosphere on the verge of the horizon in various countries, and especially on level plains, and the surface of the sea. The appearance presented is that of a double image of a given object, one of the images being in the natural

position, but greatly elevated and enlarged, and the other inverted. It was frequently seen on the dry sandy plains of Egypt by the French army, during their campaign in that country, and it assumed the appearance of a lake, reflecting the shadows of objects within and around it, but apparently receding as the thirsty soldiers eagerly approached it. The delusions of the *Fata Morgana*, which are seen in the Bay of Reggio, in the Straits of Messina, in Sicily, belong to the same class of optical deceptions; though the people of the country, who are extremely ignorant, fancy that it is actually the city of the fairy Morgana that they see, and they run down to the sea coast, clapping their hands, and crying with every mark of exultation and joy, "*Morgana! Morgana! la bella fata Morgana!*" This curious phenomenon is not seen very frequently, but when it is the sun must form an angle of 45° with the sea, which must not be disturbed by either wind or current, and then "the spectator being placed on an eminence of the city, with his back to the sun, and his face to the sea, on a sudden sees appear in the water, as in a magic glass, various multiplied objects; as, for example, a numberless series of pilasters, arches, castles, well delineated regular columns, lofty towers, superb palaces with balconies and windows, extended alleys of trees, delightful plains, with herds and flocks, &c., all in their natural colours and proper action, passing rapidly in succession along the surface of the sea, during the whole of the short period of time that the above mentioned causes remain." Sometimes the same objects are also reflected in the air, but less distinctly; and again, on other occasions, if the air be slightly

hazy, the objects will appear fringed with all the colours of the rainbow. These objects are, in fact, only those really existing in the Bay of Naples, but which could not possibly be seen in Sicily under any other circumstances. Similar delusions have been observed in various places, such as the submerged cities in the Lakes of Albano and Killarney; the spectre of the Brocken, and that seen on Cumberland Fells; the flying Dutchman, and other ships, which have been seen from time to time apparently sailing in the air; and many other similar apparitions, down to the common appearance of the looming of a ship at sea, when the distant vessel often appears twice the size that she is in reality. A very remarkable instance of the mirage occurred in the year 1798, when the coast of France was distinctly seen from the beach at Hastings, appearing greatly raised above the sea for nearly an hour, and then sinking gradually till it disappeared.

This curious phenomenon is produced when the surface of the earth or sea becomes suddenly much more heated than the atmosphere. The earth first communicates its heat to the layer of air immediately above it, and which thus becomes less dense than the upper strata, and whenever the rays of light pass through a dense medium to one less dense, they become refracted, and turn back. Sir David Brewster illustrated this phenomenon by holding a heated iron over a mass of water, and as the heat descended, the density of the fluid gradually increased from the surface to the bottom. He then withdrew the heated iron, and substituted another, on which a quantity of ice was laid. This suddenly cooled the upper part of the air over

the water, leaving the lower part warm; and till the whole became of the same degree of heat, the lower stratum of air which was next the water produced all the beautiful effects of refracting light from the objects around it, which are observed in the different forms of the mirage.

CHAPTER II.

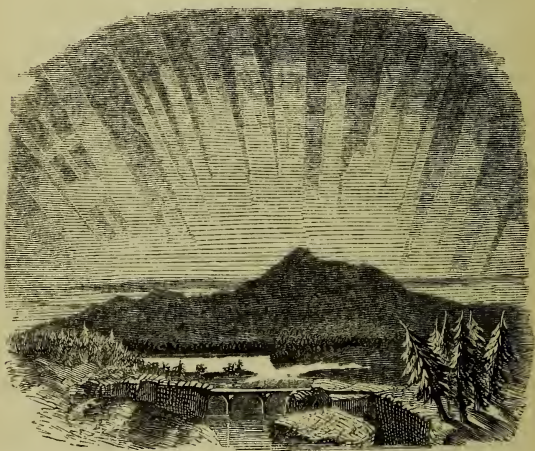
METEORS.

It is well known that inflammable air is much lighter than common air, and hence, as the inflammable air contained in the atmosphere rises naturally to its upper strata, it is there where meteors and other phenomena, occasioned by the combustion of inflammable air in the atmosphere, take place.

The aurora borealis appears to approach nearest to those single electrical discharges from the clouds called sheet or summer lightning, and, like them, it generally appears in bright flashes, which are sometimes attended by a slight crackling noise. It has been observed that the aurora is never seen but in cold latitudes where thunder and lightning are unknown, or at least very uncommon; and as thunder and lightning only occur when the electric equilibrium of the atmosphere is restored by means of aqueous vapours, it has been conjectured that the aurora borealis is occasioned by the restoration of the electrical equilibrium by the intervention of frozen particles, which being imperfect conductors become luminous whilst

transmitting this electricity. The aurora borealis is most common on the edge of the Frozen Sea, or wherever there is a vast accumulation of ice; and in these situations it is generally seen forming a luminous arch, with a dark black cloud below it, and shooting out vertical columns of pale yellow light. On other occasions it has been seen in milder climates, but it is observed, that in proportion as the climate where it appears becomes warmer, its appearance is more rare, and it becomes more like the common sheet lightning. On some occasions, however, very brilliant exhibitions of the aurora borealis have been seen even in the neighbourhood of London; and on the 12th of October, 1833, it appeared with unusual splendour at Hull. On this occasion there was a broad, irregular, semicircular belt of vivid white light stretching across the northern hemisphere of the heavens. It was exactly like a rainbow in shape, but of a pure white light, which was so extremely brilliant as to obscure the lustre of the fixed stars, and to give them a bluish tint, while the cloud beneath the arch appeared intensely black. It was first seen about half past eight in the evening, and soon after its first appearance, a number of brilliant rays began to shoot up from different parts of the arch, sometimes broad, sometimes narrow, sometimes vanishing immediately, and sometimes remaining visible for a minute or more, and looking like gigantic pillars of flame. The most extraordinary appearance, however, was a rapid waving motion attended by frequent brisk flashes of fire, which passed rapidly through the whole length of the curve. These flashes were often divided into a number of square portions, separated by broad black

lines. The exhibition was most brilliant about ten o'clock, but it continued till after two in the morning. In 1828, an aurora borealis of this kind appeared in London; and on the 7th of January, 1831, a remarkably beautiful one was seen at Woolwich, which appeared again the following night, but much fainter. Sometimes it does not appear as a distinct arch, but looks like the reflection of a large fire, and a few years



AURORA BOREALIS.

ago an appearance of this kind in London occasioned the fire engines to be out nearly all the night searching for imaginary fires. In the southern hemisphere, what is called the aurora australis exactly resembles the light seen in the aurora of the north.

The hydrogen gas, which is formed by the decomposition of water in the atmosphere, being lighter than

the other gases, rises above them, and, being very inflammable, appears easily to ignite; when it does so, it descends rapidly in the form of fireballs and falling stars, till it is extinguished by the aqueous vapours it meets with in the clouds, or near the earth. In some cases these meteors are very beautiful, and in the year 1833 a shower of them fell in America, which looked like a discharge of fire-works, and lasted about half-an-hour. In South America these luminous appearances are not uncommon; and they have been seen occasionally in almost every part of the world.

Mr. Angas, in his *Savage Life and Scenes in New Zealand*, describes a large and very brilliant meteor which passed swiftly along the sky from the westward, leaving a train of sparks surrounded by a black nimbus, like a wreath of curling smoke. He saw it burst and fall into a shower of blazing stars.

Meteors of this kind have been frequently seen in Europe, and some of the most extraordinary have even appeared in Great Britain. One of these, which was called the flaming sword, was first seen at Leeds on the 18th of May, in the year 1710. It was broad at one end and small at the other, and it moved with the broad end foremost. The light from this meteor was so sudden and bright, that the people who beheld it distinctly saw their own shadows reflected. The meteor in its course was seen in various parts of Yorkshire, Lancashire, Nottingham, and Derby; and it was singular that those who saw it fall, though they were many miles distant from each other, all fancied that it fell within a few yards of them. Nine years afterwards a blazing meteor was seen in every part of England. It first appeared like a long stream of light, but it

gradually thickened at one end till it assumed a pear-shape ; after which it became large and round like a full moon. It was agreed by all spectators in London that the splendour of this meteor was little inferior to that of the sun. In-doors the candles did not give any light, and out of doors both the moon and stars appeared so pale as scarcely to be visible. Various other meteors have been recorded, but none equal in brilliancy to those which have been already mentioned.

CHAPTER III.

AËROLITES, OR METEORIC STONES.

THESE extraordinary substances are supposed to be connected in some way or other with meteors, as most of the stones which have fallen from the atmosphere have been preceded by luminous appearances. In some cases meteors have burst with a loud explosion, and then a shower of stones has fallen upon the earth. Sometimes these stones have continued luminous till they have touched the earth, but in other cases their brightness has disappeared the moment the meteor has burst. The meteoric stones, if examined immediately after their descent, are always hot, and they fall with such force that they generally bury themselves to a considerable depth. Their size differs from small stones like pebbles, to masses of several tons weight ; they are usually round, and smell strongly of sulphur, and they are always covered with a black crust, which consists chiefly of oxide of iron. A great many

instances of the fall of these stones have been recorded from the earliest ages to the present. In the Pagan times they were supposed to come from Heaven, and were regarded as objects of particular sanctity; and, in fact, we have accounts of them in all countries and in almost all times, from the earliest records which have been handed down to us to the beginning of the present century. As nearly all the accounts are very similar to each other, a few of the most recent will suffice.

On the 18th of December, 1795, several persons, near the house of a Captain Topham in Yorkshire, heard a loud noise in the air, followed by a hissing sound, and soon after felt a shock as if a heavy body had fallen to the ground. One person, indeed, saw a large stone fall from the skies, at the distance of eight or nine yards from where he stood, and, on examining the stone, it was found to have buried itself twenty-one inches deep in the ground, and to weigh fifty-six pounds.

On the 12th of March, 1798, a similar noise was heard at Ville Franche in the Department of the Rhone, and a large meteor was seen in the air, leaving behind it a long train of light, while it emitted, with almost incessant crackling, small vivid flames like little stars. Its fall was remarked by three labourers, who observed that a loud hissing proceeded from the spot where it fell. On examining the place, it was found to have made a hole about eighteen inches deep, and to consist of a large black metallic mass, bearing considerable resemblance in shape to a calf's head, and smelling very strong of gunpowder. It was cracked in several places, and when opened its interior was found hard, and of a granular texture, presenting different kinds of iron

and other metals, mixed with different kinds of earth. The outside was partially vitrified and struck fire with steel.

The latest account that we have of the fall of any of these stones was a shower which fell near L'Aigle in Normandy, on the 26th of April, 1803. A cloud was seen passing between two and three o'clock in the afternoon, from which a noise issued like thunder; so loud that many persons ran out to see what was the matter, when the cloud burst, and a shower of stones descended, varying in weight from five to seventeen pounds. Several of them were darted down with such violence, that they were buried more than a foot deep in the ground, and they were all so hot that they burnt those who first attempted to take them up. In another account of this fall of stones in Normandy, the cloud is represented as a ball of fire, and some of the stones are said to have weighed less than half a pound. Both accounts agree in the stones being apparently compounded of different kinds of earths and metallic substances, and in all of them having a sulphureous smell. These Norman stones differed, however, from most of the other kinds which have been recorded, in being friable for some days after their descent.

CHAPTER IV.

WINDS.

WE understand by the word wind, a sensible current in the atmosphere. We have already observed that the

air is an elastic fluid, capable of compression, and subject, in some degree, to the same laws as the denser fluids. If we remove a portion of water in a large reservoir, we see the surrounding water flow in to restore the equilibrium; and, in the same manner, if a portion of air is expanded by heat or condensed by cold, a counter current is the visible and natural result. Thus no winds can blow without a counter or opposite current, and no wind can arise without a previous derangement of the general equilibrium, which has probably arisen from one of the following causes. First, the ascent of air over certain tracts heated by the sun. Secondly, evaporation, causing an actual increase in the quantity of the atmosphere; and thirdly, rain, snow, &c., causing an actual decrease in the volume of air by the return of the aqueous vapour to the earth. Currents thus produced are either permanent and general, extending over a large portion of the globe; periodical, as in the Indian Ocean; or variable and uncertain, as winds in the temperate climates. The general permanent winds blow always nearly in the same direction, and are called *trade-winds*. "On the north of the equator their direction is from the north-east (varying at times a point or two of the compass each way); on the south of the equator, they proceed from the south-east. The origin of them is this:—the powerful heat of the torrid zone rarefies, or makes lighter, the air of that region: the air, in consequence of this rarefaction, rises, and, to supply its place, a colder atmosphere from each of the temperate zones moves towards the equator. But (as in the case of the polar currents in the ocean) these north and south winds pass from regions where the rotatory motion of the earth's surface is less, to

those where it is greater. Unable at once to acquire this new velocity, they are left behind, and, instead of being north and south winds, as they would be if the earth's surface did not turn round, they become north-east and south-east winds. The space included between the second and fifth degrees of north latitude is the internal boundary of the two winds; and this space experiences calms, frequently interrupted, however, by violent storms." The trade-winds would blow regularly round the whole globe within the distance of thirty or forty degrees from the equator each way, if the space within those limits were all covered with water; but the uneven surface, and unequal temperature of the land divert and derange them. It is on this account that the trade-winds are constantly experienced only over the open ocean. The larger the expanse of ocean over which they range, the more steadily they blow; and thus in the Pacific they are commonly more steady than in the Atlantic Ocean. Both in the Atlantic and in the Pacific Ocean, the current of the trade-winds becomes broader and more directly east in its course as it advances from one side to the other of those extensive basins. On the west side of Africa, owing to the rarefaction which the air undergoes over that continent, the wind is mostly turned towards the shore; and along the coast of Chili and Peru, a south wind prevails. These are two instances of the interruption which the trade-winds experience in the neighbourhood of large masses of land; and in the Indian Ocean, the uniformity of the trade-winds is destroyed by the monsoons.

There are periodical winds, called *monsoons*, which blow half the year from one quarter, and the other half in an opposite direction. When they shift, variable

winds and violent storms prevail for a time, which render it dangerous to put to sea.

The alternate land and sea breezes, which are common on coasts and islands situated between the tropics, are another kind of periodical winds. "During the day, the air over the land is strongly heated by the sun, and a cool breeze sets in from the sea; but, in the night, the atmosphere over the land is cooled, while the sea, and, consequently, the air over it, retains a temperature nearly even at all times; accordingly, after sunset, a land breeze blows off the shore. The sea breeze generally sets in about ten in the forenoon, and lasts till six in the evening. At seven, the land breeze begins, and continues till eight in the morning, when it dies away." These alternate breezes are, perhaps, felt more powerfully on the coast of Malabar than elsewhere, as their effect there extends to a distance of twenty leagues from the land; but they are also felt on the coast of the Mediterranean, and sometimes as far north as Norway.

A hurricane, properly speaking, means a violent tempest of wind, attended by thunder and lightning, and heavy rain or hail. Hurricanes appear to have an electric origin. At the moment the electric spark produces a combination of oxygen and hydrogen, a sudden fall of rain or hail is occasioned, and a vacuum is formed, into which the superincumbent air rushes in all directions, and occasions a hurricane. The velocity of the wind on these occasions exceeds that of a cannon-ball; corn, vines, sugar-canes, houses, and forests, are all swept away, particularly in the West Indies, where these fearful storms rage with the greatest fury. The hurricane of the temperate zone moves with a velocity of about sixty feet in a second; but those of the torrid

zone move 150 or 200 feet in the same space of time. Hurricanes begin in various ways: sometimes a little black cloud rolls down the mountains, and then, unfolding itself, spreads over the whole horizon; and at other times the storm comes on in the shape of a fiery cloud, which suddenly appears in the midst of a calm and serene sky.

Among the remarkable hurricanes on record, may be mentioned one which occurred in Great Britain on the 26th of November, 1703. In London, upwards of two thousand stacks of chimneys were blown down, many houses were levelled with the ground, and many persons were killed. In the Thames 400 wherries were lost, and many barges sunk. At sea the destruction was still greater; twelve ships of war, with upwards of 1800 men on board, being totally lost, together with merchantmen.

In October, 1817, a tremendous hurricane took place in the West Indies, which was particularly severe in the island of St. Lucia, nearly all the buildings on the island being destroyed, and the ships in the port sunk, a great many lives being lost.

A violent hurricane took place in Thorndon Park, the seat of Lord Petre, near Brentwood, Essex, on the 12th of October, 1831. "The blast came on about eight o'clock in the evening and in less than four minutes the work of havoc was completed." The wind came from the south-west, and where it entered the park, it threw down a small portion of the paling. It then traversed the park in a varying sweep of about 150 yards in breadth; and the devastation it produced was terrific. In one place, it tore up by the roots several oaks sixty feet long, to which were left adhering masses of earth,

fourteen feet in length, and from three to four feet in thickness ; and in another, a beautiful beech, which had been partly removed from the soil by the tearing up of the neighbouring trees, was left with its lofty top resting on an adjoining group at an angle of about thirty degrees. The following account of the appearance the park presented the day after the storm is given by an eye-witness :—"The stems of many trees are torn off within a few feet from the earth, some at a height of two or three feet, others at a greater height ; and one elm has been severed at about twenty feet from the ground, fifteen feet of the stump having had half its body torn away. In one place, about 100 yards from this spot, the destruction has been tremendous. In a circle of nearly forty yards in diameter, whole trunks, huge limbs and branches, with immense masses of earth, lie on the ground in wild confusion, mingled in such a manner that it is impossible to count the number of trees destroyed. It appears as if a battery of heavy artillery had been directed against a great mass of timber, which had crowded that part of the park. In some instances the stems exhibit to the eye the appearance of having been cut off ; in others, they are rent from top to bottom, or have had their giant limbs twisted off, as if they had been but so many twigs. Lofty oaks have been struck near their summits, and immense portions of their upper limbs and branches torn down, but not quite severed from their parent-stem, and, they lie with their heads resting on the ground, forming a sort of tent or foliage upwards of thirty feet high. The hurricane spared neither the lofty nor the lowly, neither the mighty oak, nor the humble holly : the strong and the weak alike fell before the blast ; and stripling trees, which one

might have supposed would have escaped, shared the same fate with the monarchs of the park. Several oaks had at least a dozen immense branches torn off, while the majestic trunk has not lost a foot of its height, and in many instances the limbs and branches of standing trees are twisted and interlaced in a variety of fantastic shapes." The blast appears not to have taken a direct course, sweeping away all before it at the same height from the ground, but to have moved in an undulating direction, rising and falling over the trees like the billows of a mighty sea. "Near the house in a magnificent plantation of firs, several have been struck down or torn up, some of those destroyed having been from seventy to eighty feet high. In one place, a stately fir, nearly eleven feet in circumference, has been broken off at about the height of eighteen feet from the ground. To the stump are still attached on one side several large and graceful branches which have a very picturesque appearance." The severed part was blown to a distance of five or six yards from the foot of the tree, and was nearly covered by the trunks of three majestic elms, each ten feet in circumference, and sixty feet high. Near this place, what had been a clump of firs was reduced to a shapeless mass of trunks and branches. Altogether, not less than three hundred trees were torn up by the roots, or so much disfigured as to render it necessary to take up their remains; but most providentially no human beings were killed, the only living things that suffered being a pheasant and a crow. The hurricane also seems not to have taken the mansion in its range, and though the residence of Lord Petre's chaplain was in the park and embosomed in trees, it escaped uninjured, excepting that a few panes of

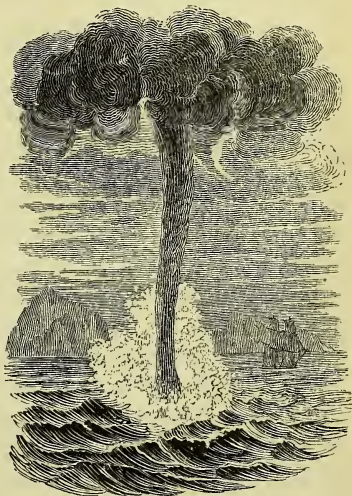
glass were broken by the flying splinters of the trees, one of which entered the bedroom of the reverend gentleman. It is singular enough that the inhabitants of the mansion were not aware of the hurricane till it was all over, and that they fancied that the noise they heard was thunder. The hurricane was immediately succeeded by a tremendous fall of rain.

The following accounts of a hurricane in New Zealand, and one in South Australia, are from the travels of Mr. Angas in those countries:—"The sirocco continued until sunset, when the sky assumed a strange and lurid aspect; smoky-looking clouds rose rapidly from the southward, and a dirty sand came flying very quickly from the south and west. The sun went down in a heavy bank, flashing dull rose-coloured rays from the blue and leaden mass that obscured the western horizon. Then there was a lull; the foaming crests of the northern waves gradually sank into repose, and a dead and breathless calm followed. The grey hour of twilight was rendered far more gloomy by the sky all round to the south and west becoming intensely black; the clouds rising like a wall, slowly and gradually, until they reached our vessel, now becalmed on the sullen bosom of the ocean, enveloped us in an almost Egyptian darkness. The awful stillness and gloom, portending a tempest, was rendered more fearful by the sudden oppressive heat that came over us, like the breath of an oven. The sails that flapped in the calm were quickly stowed, and the men, just discernible as black masses in the rigging, were busily engaged in preparing the vessel for conflict with the approaching storm. After waiting about ten minutes in breathless anxiety, the fury of the tempest burst upon us. It came sudden as thought, rushing up

from the south, black and awful, with a noise like the blast of a trumpet; and, laying the vessel over on her side, the wind whistled through the cordage till every mast shook, and every rope trembled. The violence of the wind on the water, meeting the northerly swell, sent the foam drifting along like sand; and the dead silence of the preceding moment was followed by a loud and deafening noise, that grew more terrible as the tempest waxed stronger. The sudden rushing of the storm—the sweeping foam—the roaring of the wind, howling and moaning through the rigging—the broad flashes of lightning that lit the gloom, followed by hoarse peals of thunder, audible even above the voice of the elements, and the big drops of rain—the tears of the tempest—all combined to render the scene truly grand and terrific. These hurricanes, which occur periodically on this part of the New South Wales coast, are termed ‘Brickfielders,’ and are occasioned by the air being greatly heated by the northerly winds that blow from the tropic, rising and causing a vacuum, into which the cold south wind then rushes with great violence. The fury of the storm generally abates after two hours, and it seldom lasts more than six or eight.”

“The position of the harbour of Port Nicholson, at the south-eastern entrance of Cook’s Straits, is open to the heavy gales that frequently blow from that quarter in the winter season: between the high lands that rise on each side of the entrance to the harbour, the wind, at such seasons, rushes in, as through a funnel, with unrelenting fury. These ‘south-easters,’ as they are termed, generally continue two or three days, the storm being at its height on the second day. During a very severe gale of this kind, we were unable to hold communication with

the vessel for three days; and in many of the houses no lights could be burned. So great was the violence of the wind, that it was impossible to stand out of doors, and the wooden houses rocked in such a manner at night, that many were afraid they should be blown out of their beds. Not long since, a sudden gust of wind, during one of these gales, actually raised a large boat that was on the beach, and carried it along for a considerable distance, a woman being killed on the spot where it fell. The vessels in the anchorage were rolling about tremendously; several dragged their anchors; boats were swamped and driven ashore; and the squalls swept down from the hills with an impetuosity that almost stove in the houses."



WATER-SPOUT.

Whirlwinds sometimes arise from winds blowing among lofty and precipitous mountains, which occasion the gusts to ascend with a spiral or whirling motion. They are frequently, however, formed by two winds meeting each other at an angle, and then turning upon a centre. When two winds thus encounter one another, any cloud which happens to be between them is, of course, condensed, and turned rapidly round; and all

substances, sufficiently light, are carried up into the air by the whirling motion which ensues. The action of a whirlwind at sea occasions the curious phenomenon called a *water-spout*, which is thus described by those who have witnessed it:—"From a dense cloud a cone descends, in the form of a trumpet, with the small end downwards; at the same time the surface of the sea under it is agitated and whirled round, the waters are converted into vapour, and ascend, with a spiral motion, till they unite with the cone proceeding from the cloud: frequently, however, they disperse before the junction is effected. Both columns diminish towards their point of contact, where they are not above three or four feet in diameter. In the middle of the cone forming the water-spout, there is a white transparent tube, which becomes less distinct on approaching it; and it is then discovered to be a vacant space, in which none of the small particles of water ascend; and in this, as well as around the outer edges of the water-spout, large drops of rain precipitate themselves. In calm weather, water-spouts generally preserve the perpendicular in their motion; but when acted on by winds, they move on obliquely. Sometimes they disperse suddenly; at others, they pass rapidly along the surface of the sea, and continue a quarter of an hour or more before they disappear. A notion has been entertained that they are dangerous to shipping, owing to the descent, at the instant of their breaking, of a large body of water, sufficient to sink a ship; but this does not appear to be the case, for the water descends only in the form of heavy rain."

BOOK IV.

WONDERS OF ANIMAL LIFE.

To do justice to this subject, it would be necessary to write a work on zoology ; and, indeed, no work on zoology has ever yet been written that contains one hundredth part of what may fairly be called the wonders of animal existence. Animals approach so near to man in intelligence, and yet there is a line so broadly marked between those animals which are the mere creatures of instinct, and man, who has been gifted with a portion of the divine spirit, that it is impossible not to be struck with wonder and admiration whenever the subject is investigated. Animals seem only endowed with the powers necessary to make them useful to man, and to enable them to protect themselves ; and though they may be taught many ingenious tricks, that seem for the moment almost to rival human intelligence, they can make no improvement on what they have learnt, and they are quite incapable of imparting what they have acquired to other creatures of their own kind. Notwithstanding the narrow limits within which it is manifest the Creator has confined the intelligence of animals, there is much in their habits which it is very interesting to study. They undoubtedly possess different dispositions and different degrees of capacity ; and they are capable

of affection, gratitude, friendship, and even revenge. The most extraordinary circumstance, however, is, that they appear evidently to have some means of communicating their wishes to each other, which we cannot understand. When two dogs, one much larger than the other, are kept together, and are friendly with each other, if the little dog chances to be attacked by a stranger, he generally gets the assistance of his larger friend to beat the assailant. A gentleman who had heard stories of this kind, and who kept two dogs, one of which was much larger than the other, chanced one day to see the little dog attacked by a terrier, who was much too strong for him. The little dog had been very severely treated, and rolled in the mud, but the moment his assailant left him, he trotted homewards, and his master followed him. The large dog was lying asleep in the yard, too far from the scene of battle to have seen or heard anything of it, even if he had been awake; but he roused himself at the approach of the little dog, and though neither of them uttered the slightest sound, they had no sooner smelt each other all over than they trotted off together to find the terrier, to whom the large dog gave a severe beating. Here was evidently a communication of ideas by some means which we are totally unable to explain, and numerous examples might be given, from which it is evident that not only dogs and other quadrupeds, but birds, and even insects, communicate with each other, without uttering any sound. Bees are said to converse by crossing their antennæ; and birds, though they have a chirp which indicates danger and other violent sensations, and which appears intended to call for assistance, or at any rate to give an alarm, like the barking of dogs, have certainly some other way

of giving information to each other, which is at present quite beyond our comprehension.

Some animals appear to have a practical love of mischief, particularly monkeys, who, Mrs. Lee tells us, pull the red feathers out of the parrots' tails, and run away with them, while the parrots give vent to their rage in incessant jabbering, and pecking at the monkeys with their strong beaks.

CHAPTER I.

MAMMALIA.

THE Mammalia constitute the highest class of animals; they have a back-bone and complete skeleton; they produce their young alive, and nourish them by means of milk; and they possess a heart, a brain, and a complete nervous system, so that they are acutely sensitive to pain.

MONKEYS AND APES.

MANY curious stories are told of monkeys, particularly of their imitative powers; but the most interesting of their habits is the affection which most of the kinds show to their young. A pair of the little marmozet monkeys, who had young ones in Paris, nursed them almost as human beings would have done, the male monkey being much more awkward than the female, to whom the father always gave the young ones when they became troublesome. Monkeys almost always sit erect,

and both their paws and feet bear considerable resemblance to the human hand, the feet having a thumb even more distinctly than the hands. Indeed, in some species, the thumb is wanting in the hands, but perfectly formed in the feet. The apes or baboons, which are natives of the old world, differ from the monkeys in being larger, generally without tails, and without any pouches in the cheeks; whereas, what are called monkeys, which are natives of America, have mostly long tails, with which some of the species can lay hold of a tree, or any similar object, and swing the whole weight of the body from it; and they have large pouches in the cheeks, into which they can put an immense quantity of nuts or other food, as if into a store-house, from which the animal can draw them forth to devour at pleasure.

BATS.

IF bats were not so common, how astonished we should be to hear of a mouse-like animal that could fly like a bird, particularly if we were told that the females frequently carry their young with them in their flight; yet this is the case, and the young bats, of which there are generally two, adhere so closely to their mother, as to appear like excrescences on her sides. The largest of the bat tribe occur chiefly in the islands of the Indian Archipelago, and those of the coast of Africa. These bats sometimes measure between five and six feet from tip to tip of their extended wings. The bats of one of these species, called Kalong by the Javanese, are always found in large societies. "Numerous individuals," says Dr. Horsfield, "select a large tree for their resort; and suspending themselves with the claws of their pos-

terior extremities to the naked branches, often in companies of several hundreds, afford to the stranger a very singular spectacle. A species of fig-tree, which is often found near the villages of the natives, affords them a very favourable retreat, and the extended branches of one of these trees are sometimes covered by them. They pass the greater portion of the day in sleep, hanging motionless,—ranged in succession, with the head downwards, the membrane or wings contracted about the body, and often in close contact with it; so that, as they hang, they have little resemblance to living beings, and by a person not accustomed to their habits, are readily mistaken for a part of the tree, or for a fruit of uncommon size suspended from its branches. In general, these societies preserve a perfect silence through the day; but if they are disturbed, or if a contention arises among them, they emit sharp piercing shrieks, and their awkward attempts to extricate themselves, when oppressed by the light of the sun, exhibit a ludicrous spectacle." In consequence of the sharpness of their claws, they attach themselves so strongly, that they cannot leave their hold without the assistance of their wings, and if killed in this position, they continue suspended after death.

The *spectre* or *vampire bat* is a native of South America, and it is furnished not only with sharp teeth, but with an extraordinary tongue, with which it is enabled to exercise a strong power of suction, and to draw an immense quantity of blood without making a wound large enough to attract attention; so that, when it attacks a human being, the sleep of the victim is scarcely ever interrupted.

The *Flying Lemur* is very nearly allied to the bat

family. It resembles a monkey, but an ample membrane extends from the sides of the neck to those of the tail, enfolding the arms as though nature had furnished the animal with a natural cloak. This membrane, however, differs from that of the bats, in being clothed on both sides with short thick hair, and it is useful rather as a kind of parachute to sustain the animal while it is springing from one tree to another, than for the purposes of a continued flight. The animal generally lives in trees, though it is capable of running on the ground, and it is eaten by the inhabitants of the Pellew Islands, though it smells extremely like a fox.

THE MOLE.

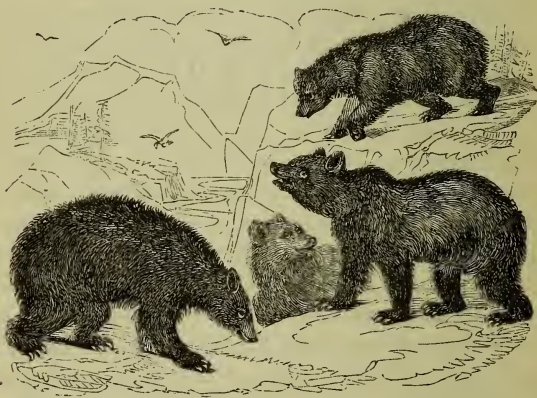
EVERY one who has seen a mole—and who has not?—must have observed the extraordinary softness of the fur, which it is impossible to ruffle, as the hairs are very short, and each stands quite erect from the skin. This peculiar arrangement of hair is admirably contrived for the mole, as that animal lives in narrow passages only just fitting the body; and, as it has occasion to run backwards in these passages as well as forwards, if the hair were long and placed in a slanting direction, like that of other animals, it would be continually becoming entangled. The moles are furnished with very small eyes (which are so inconspicuous, that the country people commonly believe that moles have no eyes); no external ears, though the sense of hearing is remarkably acute; a long pointed snout, which is very strong and flexible; and two curiously-shaped paws, which resemble little hands, and which are admirably adapted for the use to which they are applied by the mole, that is, scraping

out the earth. The organs of sight are very feebly developed in this animal, but the senses of hearing, touch, and smell, are remarkably acute. The galleries of the mole are most curiously constructed, and they all end in a kind of chamber as far as possible from the opening to each run, and in this chamber the nest of the mole is constructed. Moles are extremely voracious, and though they feed generally on earth worms, and the grubs of beetles, and other insects which they find in the ground, they will occasionally attack frogs, and will devour the dead bodies of birds when they can find them. It has long been a disputed point with farmers, whether moles do most good or harm. It is certain that they lighten stiff land, by throwing up the earth they excavate in forming their runs into what are called mole-hills; but it is also certain that they disturb the roots of plants, and lately it has been discovered that they actually destroy corn, at least for their young, as no less than 402 stalks of wheat have been found in the nest of a female mole. One very curious circumstance relating to the mole is, that it contrives to supply itself with water by forming, in different places in its runs, little pits, which are always full of water, and which serve also to keep the runs dry. Moles are very pugnacious, and they fight most furiously till one is killed, when the survivor generally tears the dead body to pieces, with a degree of ferocity which seems more suitable to a savage hyæna, than a creature so gentle and quiet in its appearance as the mole.

THE BEAR.

THE bear is one of those which naturalists call the flat-footed animals, and certainly of all carnivorous

beasts, it appears the least qualified either to pursue its prey actively, or to gain it by lying in ambush. The movements of the bear are comparatively slow, and the nearly equal length of its fore and hind legs deprives it of the power of leaping. Bears are generally, however, very adroit in climbing, and, as they are very fond of honey, as well as of some kinds of fruit, they find this power of the greatest use to them. They have also immense muscular force in the front paws; and their strength is so enormous that the common grizzly bear in America has been known to drag away the carcass of a buffalo, 1000 pounds in weight. When they seize an animal they generally destroy it by squeezing it to death.



BEARS.

The badger is another of the flat-footed animals, and though its general appearance does not give one the idea of a bear, such as we see them in menageries, yet it is evident that there must be a considerable

degree of likeness, as Mr. St. John, a close observer of nature, in his *Wild Sports of the Highlands*, says, "the badger always puts me in mind of a miniature bear, and to this family he evidently belongs. 'His proportions are similar to those of the bear; his manner of placing his feet on the ground is like that of a bear, and is very peculiar. Beyond the marks of his toes, which, five in number, mark the ground in nearly a straight line, are the impressions of his strong sharp nails, apparently unconnected with, and at the distance of an inch or two from, the rest of his track.'" These long and powerful nails are the principal weapons of the badger, and he fights with them with such fury, that he frequently kills the dogs that are sent to attack him; he has also wonderful strength in his jaws. The immense muscular power that the badger has in his chest and fore-legs enables him to dig with the greatest rapidity; and he can stand with perfect impunity a blow on his forehead that would split the frontal bone of an ox. When badgers are seen at a distance, they have very much the appearance of pigs, as they go awkwardly trotting along, smelling the ground and grunting gently. There is a common proverb in the north, "as dirty as a badger," but Mr. St. John, who is an excellent authority in such matters, says, that the animal in a state of nature is remarkable for his cleanliness: "his extensive burrows are always kept perfectly clean, and free from all offensive smell; no filth is ever found about his abode; everything likely to offend his olfactory nerves is carefully removed. I once, in the north of Scotland, fell in with a perfect colony of badgers; they had taken up their abode in an unfrequented range of wooded rocks, and appeared to have been little interrupted in their posses-

sion of them. The foot-paths to and from their numerous holes were beaten quite hard ; and what is remarkable and worthy of note, they had different small pits dug at a certain distance from their abodes, which were evidently used as receptacles for all offensive filth ;" every other part of their colony was perfectly clean. The badger is called in Scotland a brock, and is still common in that country, though it is rarely now met with wild in any other part of Great Britain. Badgers make themselves curious chambers underground, in which they live and store their winter food ; the latter consisting principally of dried grass rolled into balls as large as a man's fist. It is said that the badger has a singular power of distending the skin of its throat, so that when it is seized by a dog, the dog only bites through the skin without wounding the flesh. Badgers are remarkably fond of attacking the nests of the wasp or the wild bee ; and in this respect also they resemble the bear, which, as before observed, is particularly fond of honey. The badger has, however, two peculiarities which distinguish it from the bears, one of which is, that it always rolls itself up when attacked ; and the other, that it is remarkably ingenious in making its escape when confined. When first caught, says Mr. St. John, the efforts of a badger to escape show a degree of strength and ingenuity which is quite wonderful, and he will dig and tear at his prison with the strength of a rhinoceros ; but if looked at, he immediately rolls himself up into a ball, and remains quite motionless. Mr. St. John adds, that he once caught a wounded badger which he took home with him, putting it into a court-yard, whence he thought it impossible the creature could escape. "The next morning, however, he was gone, having displaced a

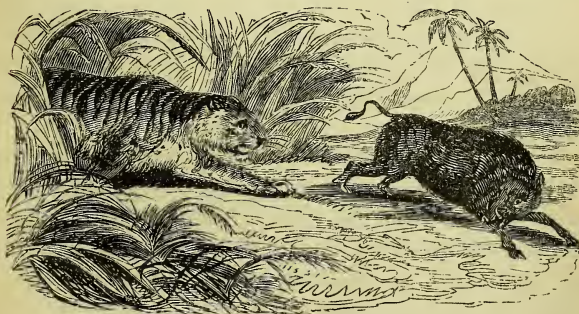
stone that I thought him quite incapable of moving, and then digging under the wall, he got away."

The marmots are nearly allied to the badgers, but they pass their winters in a torpid state.

The rattle, or Cape glutton, which belongs to the same tribe, is, on the contrary, much more lively and active in its habits than either the badger or the bear; and the one in the London Zoological Gardens is remarkable for its playfulness and good-humour. "It solicits attention by a great variety of postures, and tumbles head over heels as soon as it has succeeded in attracting the attention of a visitor."

THE CAT TRIBE.

OF all the carnivorous animals those included in this tribe are, perhaps, the most interesting, as amongst



TIGER AND WILD BOAR.

them are lions, tigers, panthers, and, in fact, all the most beautiful of what we generally call wild beasts.

The animals belonging to this tribe, though they scarcely ever run, are almost constantly in action both by day and by night, as they generally either creep slowly along, often crouching near the ground, as they do so, till they reach their prey, or advance rapidly by prodigious bounds, owing, it is believed, to the extreme flexibility of their limbs, and of the joints of the back bone. The sense of sight, especially during twilight, is acute, and the senses of hearing and feeling are perfect; but the senses of smell and taste are obtuse. The tongue of these animals does not appear sensitive like that of other creatures, but may, in fact, be called an organ of mastication almost as much as the teeth: "the sharp and callous points with which it is covered being used for tearing away the softer parts of the animal substances on which they prey." All the feline tribe have whiskers, not merely for ornament, but use; as "the perception of touch is said to reside in great perfection in the small bulbs at their base." Hence, when a cat wishes to pass through a hole, she puts her head in slowly first, and if she finds her whiskers touched she draws back, as she knows there will not be room for her body.

The lion is generally considered the king of beasts; and all the old books on natural history are full of praises of his nobleness and courage. Modern naturalists, however, have discovered that these praises are undeserved, and that the lion, which is well known to be an animal of the cat kind, partakes of the character of a cat in its want of courage, and in its substitution of cunning for bravery. Thus, instead of a lion being too magnanimous to attack a man, unless he is excited by extreme hunger, they say he is too cowardly to do so; and, as a proof of

his cat-like propensities, it is a fact that the lion, in a wild state, steals through the jungle to attack his prey, and does not show himself till it is within reach for him to spring upon it. The foot of the lion is furnished with the same apparatus for extending its claws, and drawing them back, that we see in the foot of the common cat; and as by this apparatus only the soft parts of the foot are brought in contact with the ground, it contributes to the noiseless tread and cautious habits of the feline tribe. Every one who has suffered a cat to lick the hand, knows how rough a cat's tongue is; and if that of the lion were examined, it would be found exactly the same. It is peculiar to this tribe of animals, that they never eat their prey directly after having caught it. When a cat catches a bird or a mouse, she will play with it for some time before she kills it; and any one who sees a lion fed in the Zoological Gardens may observe, that when he has a bone given to him in his den, he never begins to eat it directly, but will put it under him and will growl furiously over it for some minutes before he begins to gnaw it; differing remarkably, in this respect, from a wolf, or any other animal of the dog tribe, as these creatures begin to destroy their prey the moment they have seized it. "All animals of the dog tribe," says Mr. Waterton, "must be combated with might and main, and with unceasing exertion, in their attacks upon man; for, from the moment they obtain the mastery, they worry and tear their victim as long as life remains in it. On the contrary, animals of the cat tribe having once overcome their prey, they cease for a certain time to inflict further injury on it. Thus, during the momentous interval from the stroke which has laid a man beneath a lion, to the time when the lion

shall begin to devour him, the man may have it in his power to rise again, either by his own exertions, or by the fortuitous intervention of an armed friend. But then all depends upon quiet, extreme quiet, on the part of the man, until he plunges his dagger into the heart of the animal; for if he tries to resist, he is sure to feel the force of his adversary's claws and teeth with redoubled vengeance. Many years ago, Colonel Duff, in India, was laid low by the stroke of a Bengal tiger. On coming to himself, he found the animal standing over him. Recollecting that he had his dirk by his side, he drew it out of the case in the most cautious manner possible, and by one happy thrust quite through the heart, he laid the tiger dead at his side."

All the cat tribe, when well supplied with food, seem to delight in throwing themselves about in graceful attitudes in a kind of play; and lions and tigers, when much pleased, purr like the common domestic cat. The lion is distinguished from the tiger not only by his colour, but by his large and flowing mane, and by his tufted tail, in the midst of the hair of which is a black prickle-like horn, like a small claw. The ancients were aware of this peculiarity, and one of the early commentators on the Iliad, referring to the passage where Homer describes the lion as lashing himself with his tail to provoke himself to rage, mentions this prickle, and asserts, that when punctured by it, it is not surprising that the lion should become irritable. Modern naturalists, however, assert, that the prickle is so small, and so buried in the tuft of hair, that it is impossible it could wound the sides of the lion, however vehemently he might lash them with his tail; but they all agree that this prickle or small claw does exist, and they do not give any ex-

planation of its use. In the Nimroud sculptures, which are supposed to be part of the ruins of Nineveh, which were removed to the British Museum in June, 1847, there is represented a lion hunt, and in one of the lions there is an exaggerated representation of the claw in the tail.

Domestic cats are not all descended from the same origin, and, in fact, there are four or five quite distinct varieties. The wild cat of the woods has the peculiarity of having the tail thickened at the tip; and the Egyptian cat, of which we sometimes see mummies preserved in museums, had a tuft of hair at the tip of its tail like a lion. Most domestic cats have their tails tapering to a point at the tip, but the tabby and the black cats have somewhat thicker tails than cats of lighter colours, and, indeed, seem to bear most resemblance to the wild cats in this respect. If the tails of ordinary cats are observed, they will be found to differ considerably; and we had once a tabby cat which had a tail that she could curl like the tail of a pug dog. The tortoise-shell cats were originally brought from Spain; and it is only the females of this race that are tortoise-shell, the males being of a kind of buff, with dark stripes of a reddish hue. The white cats are descended from the Chartreuse breed, and they have all a bluish tinge in their fur, and red eyes. Some of these cats are without tails, and others have tails which look as if a joint or two had been cut off. The Angora cats are quite distinct, and are known by their long silky hair, and large bushy tails. When a cat is enraged, its hair stands erect, and its tail swells to an enormous size.

THE DOG TRIBE.

THE sagacity and fidelity of dogs are so well known, that it seems scarcely necessary to say anything here in their praise. Indeed, in some cases, the instinct of the dog approaches so near to the intelligence of man, that it is extremely difficult to know where to draw the line. There are, however, some points in which the superiority of the intellect of man to the most sagacious of the brute creation, is evident at a single glance; and one is, that no brute, however quick it may be found to learn any kind of trick, has yet been found capable of imparting what it has acquired to another. A dancing dog cannot teach another dog to dance, and one who has learnt to pick out letters, or perform any other tricks, can only do exactly what it has been taught without the power of making any variation, and very often can only perform them at the command of the master who taught them. In the summer of 1845, there was a dog in Paris who performed in a melodrama the part of a smuggler's dog, who opened a cupboard door, and took out some food for the smugglers, shutting the door again carefully; stole a key, which he carried to a prisoner to set him free, and contrived to get his own neck out of a collar by which he was chained up, with many other tricks that almost seemed to vie with human intelligence. So far, however, from this being the case, the dog was so incapable of performing without the presence of its own master, that it was found necessary to engage the latter at a considerable salary to appear every night on the stage, though he was no performer, even after he had sold his dog to the manager. Many curious stories

are related of the instinct of dogs, and, amongst others, that pointers in the fen country, instead of putting out a foot when they smell game, which could not be seen among the numerous rushes and similar plants which grow in the fens, stand up upon their hind feet, so that their noses are seen above the herbage.

Wolves are nearly allied to dogs, and have in many respects the same habits; but they are more ferocious and more cowardly. When excited by hunger, they will attack the stables or outhouses of a dwelling-house; and in the northern regions, wolves are said frequently to venture upon the ice for the purpose of destroying the young seals. The wolf is occasionally afflicted with madness, which resembles the hydrophobia of the dog. Wolves, like dogs, when in a wild state associate together, as do the jackals.

Foxes also belong to this tribe, but they are distinguished by their bushy tails and offensive smell.

THE WEASEL TRIBE.

THE animals belonging to this tribe are all considered as vermin. They are very blood-thirsty, and as, from their slender flexible forms, they can easily penetrate into poultry-yards and other enclosures, they do a great deal of mischief. The polecat has a remarkably offensive smell, and very singular habits. In Scotland it is called the foumart, and one in that country having been observed to catch a frog was followed to its den, two miles off. Its track having been traced and its hole found, the nest was dug out, and in it were five young polecats nearly half-grown, sleek, clean, and well fed. The correspondent of *The Magazine of Natural History* who

relates this, continues, "they [the young polecats] were comfortably embedded in dry withered grass; and where they were lodged all things were tight and snug to a wonder; but in a side hole, of proper dimensions for such a larder, I poked out, and counted most carefully, forty large frogs and two toads. But the most singular thing was this, that they were all and every one of them alive, but merely so; capable of sprawling a little, and that was all. For the mother, with a prudence and care for the comfort of her family highly creditable, and guided by some instinct to a surgical knowledge and skill that has ever since appeared to me most unaccountable, had contrived to strike them all with palsy. They were, as I said, merely capable of sprawling, but not of moving away, or into the nest, which would doubtless have been very inconvenient, as any one may easily suppose. On examination, I found that the whole number of puddocks [frogs], toads and all, were purposely and dexterously bitten through the brain." On another occasion, according to Mr. St. John, when the larder of a she polecat was examined, it was found to contain, amongst a variety of other things, the remains of three kittens which had been drowned at the distance of at least a quarter of a mile from the polecat's abode. Bewick also mentions that eleven eels were once found in a polecat's retreat. One of the peculiarities of these creatures is, that when they get into a poultry-yard or pigeon-house, they kill all the birds within their reach before they begin to eat one, and thus, on one occasion, a polecat was found to have killed no less than fifteen turkeys, none of the bodies of which were injured, though the polecat was caught sucking the blood of one of them. Notwithstanding the disagree-

able smell of this creature, it has beautiful fur, and that of the polecats of the north is frequently used for muffs and tippets in this country, under the name of fitch. In some cases, indeed, the polecat is called the fitchet. Several of the animals belonging to this family have their skins used for furs; but one of the most valuable skins employed for that purpose is that of the Siberian marten, which we call the sable, and the hairs of which are so fine and soft, that when blown upon they will lie smooth in whatever direction they chance to fall.

The otter is very fond of fish, but, strange to say, it only eats the upper part, leaving the tail floating in the water. These mangled remains are, however, frequently eaten by the poorer classes, and Mr. St. John relates a story on the subject. At one of the falls of the Findhorn, he says, "I was much amused to hear the lamentation of an old woman on the badness of the times, when, after enumerating all her other troubles, she added, 'and the otters, too, are all gone, puir beasties.'—'Well, but what good could the otters do you?' I asked her.—'Good, your honour? why scarcely a morn came but they left a bonny grilse on the scarp down yonder, and the *vennison* was none the waur of the bit the puir beasts eat themselves.' The people there (in the north of Scotland) call every eatable animal, fish, flesh, or fowl, venison, or, as they pronounce it, 'vennison.' For instance, they tell you that the snipes are 'good vennison,' or that the trout are not 'good vennison' in the winter."

AMPHIBIOUS ANIMALS.



SEAL

THE seal is called amphibious, but though it is furnished with four feet, its natural place of abode appears to be the sea, as its movements on land are excessively painful and awkward. The feet are so short, and so enveloped in skin, that they are of scarcely any use in assisting the motion of the animal on land; and its progress on solid ground is only effected by a sort of tumbling, jumping, or shuffling motion, excessively ridiculous to a looker-on. The fore-feet are, however, furnished with claws which are very useful to the animals to lay hold of the rocks when they are climbing out of the water; and as the toes are united by webs, the fore-feet serve as oars, while the hinder ones, which the seal generally drags after it, serve as a rudder, in much the same way as the tail of a fish. The animal is, in fact, admirably adapted for gliding through the water, not only in the outward form of its body, but in all the details of its construction. The flesh is covered with a

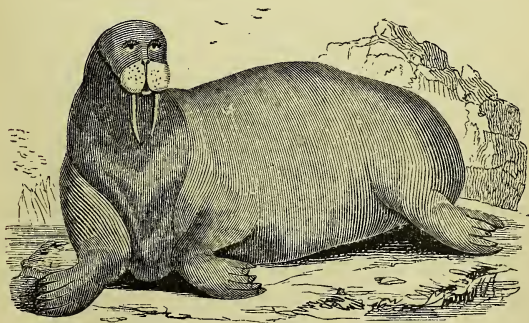
thick layer of fat, which not only prevents the animal from being injured by sudden changes of temperature, as it retains the heat in the body, but it also renders the seal considerably lighter in proportion to its size than it would be under any other circumstances, and thus renders it easier to float in the water.

The following description of the general appearance of the seal is taken from Mr. Beete Jukes's very entertaining work called *Excursions in Newfoundland*. "We brought one young seal on board to-day, alive and unhurt, by my particular request. He lay very quiet on the deck, opening and closing his curious nostrils (which, when expanded, were nearly round, but closed firmly into a narrow slit), and occasionally lifting his fine dark lustrous eyes as if with wonder at the strange scene around him. His fur being quite dry and clean was as white as wool, short, and close, and thick, composed of strong hair standing out perpendicularly everywhere, except on his face and his flippers or paws. On being patted on the head he drew it in, making his face perpendicular to his body, knitted his brows, shut up his eyes and nostrils, and he then presented a very droll appearance, looking like a comical countenance in a circular bush-wig. With his head extended, however, and his eyes open, he was really a very pretty creature, looking so warm, and round, and comfortable. When teased, although quite young, he was fierce, biting and scratching at everything about him; but on being patted and stroked he immediately became quiet."

On another occasion, Mr. Jukes says, "we picked up a few young seals, and as one of them was shedding his white coat, we eased him entirely of it, and disclosed his

second coat, a beautifully spotted skin of short smooth hair,—grey and black.” The seal is furnished with whiskers, which, like those of the cat, appear to be very sensitive, and to serve as organs of touch. Mr. Jukes mentions that there are four species of seals known on the coast of Newfoundland, viz. the bay seal, which is the smallest of the four, and which is never found at any great distance from land; the harp seal, which is that most commonly found on the icebergs, and the one generally taken for its oil and skin; the hooded seal; and the square flipper, which is very large and very scarce. The harp seal, which is the most common, is so named from having, in addition to the usual spots, “a broad curved line of connected blotches proceeding from each shoulder, and meeting on the back above the tail, forming a figure something like an ancient harp or lyre. The female has not this harp, neither has the male till after his second year. The young, when born, are covered with the white fur already described; they are then called ‘white coats:’ at about five or six weeks old they shed this white coat, and a smooth spotted skin appears; they are then called young harps. When twelve months old, the males are still scarcely to be distinguished from the females, and during that season they are called ‘bedlamers.’ The next season, the male has assumed his harp.” The hooded seals are larger than the harps; their skin is of a lighter grey, and the spots and blotches with which they are marked are very irregular. The male, called a “dog hood,” is distinguished by a singular hood, or bag of soft flesh, on his nose. When attacked or alarmed, he inflates this hood, so as to cover the face and eyes; and it resists shot. The young of this species are not provided with the thick woolly coat of the

young harp seals, or, if they have it, it is shed when they are very young. They are white on the lower part of the body, but their backs have a bluish tinge, and hence they are generally called blue backs. "Those which were brought on board alive, seemed much more gentle and tamer than the white coats, and when teased, they did not offer to scratch and bite so much as the others." The hooded seals are not found in such large herds as the harps, and as their fat is not so thick, they are considered very inferior in value. These seals appear to have more affection than the others, and the sealers say that if they can kill a female, they are sure of several others, as her young ones will not leave her, and the male "will not go far from the spot, but keeps continually popping his head up in the holes and pools about, growling and whining after his mate."



WALRUS, OR SEA HORSE.

The walrus or sea-horse closely resembles the seal in the formation of its feet; but it is also furnished with

two large tusks in the upper jaw, the points of which hang down and nearly unite, and which sometimes are twenty-four inches long. These tusks do not appear till the creature is full grown, and when seen at a distance without tusks, its head very closely resembles the human face. "As this animal," says Mr. Scoresby, "is in the habit of raising its head above water, to look at ships and other passing objects, it is not at all improbable but that it may have afforded foundation for some of the stories of mermaids or mermen. I have myself seen a sea-horse in such a position and under such circumstances, that it required little stretch of imagination to mistake it for a human being; so like, indeed, was it, that the surgeon of the ship actually reported to me his having seen a man with his head just appearing above the surface of the water." The tusks of the sea-horse are equal in durability to those of the elephant, and as they keep their colour better, they are frequently used by dentists to make artificial teeth.

THE KANGAROO FAMILY, OR MARSUPIALIAN ANIMALS.

IN these creatures the singular phenomenon is presented, of an animal using its tail as a third hind-leg. Kangaroos, in general, dwell in troops of from twelve to thirty, under the guidance of a respectable old captain, who is evidently much looked up to by the rest. In a state of repose, they rest, as it were, on a kind of tripod composed of the two hinder legs, and the tail, with the two fore-legs hanging down like hands, and the body nearly perpendicular. When they move, it is generally by repeated bounds, leaping sometimes, it is said, nearly thirty feet at a single spring. Nothing can be

more ludicrous than the sight of these animals in motion, as they go jumping about, dangling their little fore-feet before them in the most ridiculous manner possible. Mr. Cunningham, in his work on *New South Wales*, gives the following account of a kangaroo hunt:—"From the great length of their hind-legs and tail, they are enabled to stand on the firm bottom of a pond, while the dogs are obliged to swim, and in this way a fight between a large kangaroo and a pack of dogs affords a most amusing spectacle. The kangaroo stands generally upright, with his fore-paws spread out before him, wheeling round and round to ward off his assailants; and whenever one arrives within reach, he pounces his paws upon him, and, sousing him suddenly under, holds him fast in this position, gazing all the while around with the most solemn simpleton sort of aspect, heedless of the kicking and sprawling of his victim, whom he quickly puts an end to, if some courageous colleague does not in good time advance to his aid, so as to force the kangaroo to let his half-drowned antagonist bob above water again, who, the moment he does so, paddles forthwith toward shore, shaking his ears and looking most piteously, with no inclination to venture in a second time, notwithstanding all the halloos and cheerings with which you may urge him." In this way the battle is continued for some time, without any great mischief being done on either side, till the kangaroo begins to be weary of it, when he leaps out of the water and bounds away at such a pace as renders it quite impossible for the dogs to overtake him.

The females of all the animals belonging to the Marsupialian or Kangaroo tribe are furnished with a pouch in front, in which they carry their young, and it adds to the

oddity of the appearance of the female kangaroo, when she goes leaping along, to see her young ones peeping out from the little bag which she carries before her.

THE SQUIRREL TRIBE, OR GNAWERS.

THE animals belonging to this tribe confine themselves to a vegetable diet, and as they are furnished with very sharp teeth, they live principally upon nuts, the bark of trees, and other similar substances. The animals included in this tribe are generally lively, and very active.

The common squirrel, with its varieties the black and the gray, are all very beautiful, and they have all the same habits of hiding their food when they have more than they can eat. The common squirrel does this sometimes in a very curious manner; and one belonging to a lady of my acquaintance, which was allowed to go loose and to climb on his mistress's shoulder, stuffed the bands of her hair so full of nuts, that at night, when her maid took the combs out of her hair before going to bed, the nuts rolled down in all directions, to the great astonishment of the poor girl, who could not imagine what her mistress had been doing to her hair.

The flying squirrel is very pretty, but, like all the other flying quadrupeds, it merely receives the name from a portion of skin growing from the fore to the hind legs, which acts as a parachute, and greatly aids it when it is in the act of leaping. It has the same habits of hiding as the common; and one that was kept by a gentleman in Staffordshire, used to steal lumps of sugar out of the sugar-basin, and hide them among the leaves of a carved cornice round the ceil-

ing of a room. The house was old; in damp weather the sugar melted, and ran down the walls; this led



FLYING SQUIRREL.

to a discovery; and a great quantity of sugar that had been missed, and the theft of which had been attributed to a servant, was found in this very odd hiding-place.

The ayeaye, or long-fingered rat of Madagascar, is remarkable for the long slender fingers of its fore-paws, and its very curious feet, which look like human hands. The different kinds of marmots and dormice belong to this division, as also the common rats and mice; all of which are celebrated for their gnawing propensities. To the Rodentia, or gnawing animals, also belong the hamster and the chinchilla, both celebrated for their fur; the jerboa, or jumping hare of the Cape, which

uses its tail almost like a kangaroo; the common hare; the rabbit; the guinea pig; the porcupine; and the beaver. Of the latter animal many curious stories have been told, particularly of the manner in which it builds its dwelling; but the observations of modern naturalists prove that these have been much exaggerated, as it does not appear that the beaver either divides his house into rooms, or uses his tail for a trowel or a sledge. It is true, however, that the beaver builds itself a house of the young branches of trees, which it gnaws through, and carrying them to the place where it wishes to build, piles them upon one another very ingeniously, fixing them in the bank of a river. A young beaver brought to England in 1832, gave a very amusing proof of his building propensities. He was quite domesticated, and suffered to wander about the house, though his favourite abode was the hearth-rug in his master's library. One day, however, he found out the housemaid's closet, and immediately went to work to build himself a house. He first seized a large sweeping brush, and dragged it along with his teeth to a room where he found the door open; he afterwards laid hold of a warming-pan in the same manner, and having laid the handles across, he filled up the walls of the angle made by them with the wall, with hand-brushes, baskets, boots, books, towels, and anything he could lay hold of. As his walls grew high, he would often sit, propped up by his tail, (with which he supported himself admirably,) to look at what he had done; and if the disposition of any of his building materials did not satisfy him, he would pull part of his work down, and lay it again more evenly. It was astonishing how well he managed to arrange the incongruous materials he had chosen, and how cleverly he

contrived to remove them, sometimes carrying them between his right fore-paw and his chin, sometimes dragging them with his teeth, and sometimes pushing them along with his chin. When he had built his walls, he made himself a nest in the centre, and sat up in it, combing his hair with the nails of his hind feet.

THE SLOTH.

THE sloth is one of those unfortunate animals whose fate it is to be libelled whenever they are spoken of, and to be the victims of a prejudice which, though it is not true, everybody believes, and which it is very difficult to destroy. Mr. Waterton was the first naturalist who ventured to redeem the sloth from the charges brought against it, and to place the habits of the animal in their true light. We find in all cases, that animals intended to live in particular situations, are admirably fitted by nature for the situations they are to occupy. The sloth is essentially an arboreal animal; and as it is intended to live on trees, it finds it as difficult to crawl on the ground, as the seal does to move when it is out of the water. Mr. Waterton justly observes, that the principal reason why the habits of the sloth were so long misunderstood was, that no naturalist had seen him in his native habitation. When Mr. Waterton visited South America, he determined to investigate the subject thoroughly, and the following observations are the result.

“Man but little frequents these thick and noble forests, which extend far and wide on every side of us. This, then, is the proper place to go in quest of the sloth. We will first take a near view of him; as, by

obtaining a knowledge of his anatomy, we shall be enabled to account for his movements hereafter, when we see him in his proper haunts. His fore-legs, or, more correctly speaking, his arms, are apparently much too long; while his hind-legs are very short, and look as if they could be bent almost to the shape of a corkscrew. Both the fore and hind legs, by their form, and by the manner in which they are joined to the body, are quite incapacitated from acting in a perpendicular direction, or in supporting it on the earth, as the bodies of other quadrupeds are supported by their legs. Hence, when you place the sloth on the floor, the lower part of his body touches the ground. Now, granted that he supported himself on his legs, like other animals, nevertheless he would be in pain, for he has no soles to his feet, and his claws are sharp and long, and curved; so that, were his body supported by his feet, it would be by their extremities; just as your body would be, were you to throw yourself on all fours, and try to support it on the ends of your toes and fingers. Some years ago I kept a sloth in my room for several months. I often took him out of the house and placed him upon the ground, in order to have an opportunity of observing his motions. If the ground were rough, he would pull himself forwards, by means of his fore-legs, at a pretty good pace; and he invariably immediately shaped his course towards the nearest tree: but, if I put him upon a smooth and well-trodden part of the road, he appeared to be in trouble and distress. His favourite abode was the back of a chair; and, after getting all his legs in a line upon the topmost part of it, he would hang there for hours together, and often with a low and inward cry, would seem to invite me to take notice of him."

“The sloth, in his wild state, is doomed to spend his whole life in trees, and, what is more extraordinary, not *upon* the branches, like the squirrel and the monkey, but *under* them. He moves suspended from the branch; he rests suspended from it, and he sleeps suspended from it.” “It must be observed, that the sloth does not hang head-downwards, like the vampire. When asleep, he supports himself from a branch parallel to the earth. He first seizes the branch with one arm, and then with the other; and, after that, brings up both his legs, one by one, to the same branch; so that all four are in a line: he seems perfectly at rest in this position. Now, had he a tail, he would be at a loss to know what to do with it in this position; were he to draw it up between his legs, it would interfere with them; and were he to let it hang down, it would become the sport of the winds. Thus his deficiency of tail is a benefit to him; it is merely an apology for a tail, scarcely exceeding an inch and a half in length. I observed, when he was climbing, he never used his arms both together, but first one and then the other, and so on alternately. There is a singularity in his hair, different from that of all other animals, and, I believe, hitherto unnoticed by naturalists; his hair is thick and coarse at the extremity, and gradually tapers to the root, where it becomes as fine as a spider’s web. His fur has so much the hue of the moss which grows on the branches of the trees, that it is very difficult to make him out when he is at rest.” On another occasion, when crossing a river, Mr. Waterton saw a large two-toed sloth on the ground near the bank, and as soon as the party came up he threw himself upon his back, and defended himself in gallant style with his fore-legs; but Mr. Waterton, with the kindness of heart

which always distinguishes him, would not suffer the poor creature to be hurt, and taking a long stick which was lying near, held it for him to hook on, and then conveyed him to a high and stately mora. "He ascended with wonderful rapidity," continues Mr. Waterton, "and in about a minute he was almost at the top of the tree. He now went off in a side direction, and caught hold of the branch of a neighbouring tree; he then proceeded toward the heart of the forest. I stood looking on, lost in amazement at his singular mode of progress. I followed him with my eye till the intervening branches closed in betwixt us, and then I lost sight for ever of the two-toed sloth."

The armadillo is covered with a defensive armour, or kind of bony shell, divided into scales, which enable the creature to move freely, though the shell covers the head, and sometimes even the tail, as well as the body. These animals live in burrows, like rabbits, and they feed partly on vegetables, and partly on worms, reptiles, and various kinds of insects. Mr. Waterton, to whom natural history is indebted for so many interesting particulars respecting the animals of South America, gives a long account of the difficulty he had in obtaining a specimen of the armadillo, as he was obliged to make his Indians dig it out of its hole; and as these holes were almost innumerable, the first point was to ascertain which of them contained armadillos, and this the Indians did by putting a stick down the mouth of each hole, and then watching if any mosquitos made their appearance. If they did, the Indians declared themselves certain that an armadillo was in the hole; and, on the contrary, when no mosquitos appeared, they were quite sure there was no armadillo. "The Indians and ne-

groes," continues Mr. Waterton, "are very fond of the flesh, but I consider it strong and rank. On laying hold of the armadillo, you must be cautious not to come in contact with his feet; they are armed with sharp claws, and will inflict severe wounds: when not molested, he is harmless and innocent. The armadillo swims well in time of need, but does not go into the water by choice. He is very seldom seen abroad during the day, and when surprised he is sure to be near the mouth of his hole. Every part of him is well protected by his shell, except the ears. In life, this shell is very limber, so that the animal is enabled to go at full stretch, or roll himself up into a ball, as occasion may require."

The Australian hedgehog (*Echidna*), and the duck-bill or water-mole (*Ornithorhynchus*), are two of the most extraordinary animals in the world. Among other peculiarities in their structure, the males have, in addition to five claws on each foot, a spur on their hind-legs resembling that of a cock, but pierced by a canal capable of transmitting through it a liquid of a venomous quality, almost like that which is imparted by the bite of a serpent. The Australian hedgehog has no teeth, but their place is partly supplied by several rows of small spines on the palate, directed backwards. The muzzle is long and flexible, somewhat resembling the beak of a bird, and it is terminated by a very small mouth, containing a long tongue, which the creature can extend at pleasure. The body is short and rounded, and covered with strong sharp spines, mixed with hair. The legs are very short, and each foot is furnished with five long and powerful claws. The tail is so short, that it was at first doubted whether the creature had one. These animals feed on insects, and burrow under ground with great

strength and celerity. They will even make their way beneath a wall, or under a pretty strong pavement. "During these exertions their bodies become greatly lengthened, so as to present a very different appearance from that of their ordinary state. They keep much under ground during dry weather, and move about chiefly during the rains. They are capable of supporting a long-continued abstinence, and seem subject to a kind of numbness or peculiar stiffness, which will sometimes continue for upwards of eighty hours, and is frequently renewed when they are retained in captivity."

The duck-bill, or *Ornithorhynchus*, is a still more extraordinary animal than the last, as its muzzle is prolonged into a broad flattened beak, greatly resembling that of a duck; but, strange to say, there are two teeth fixed in the gums on each side the beak. The head is like that of the mole, with very small eyes, and no external ears. The tongue is double, there being one within the beak, and another at its base, which is short and thick. The legs are very short, and each foot has five toes, which are united by a membrane which projects beneath them, and in the front toes reaches as far as the nails. The hind feet of the male are furnished with the spur before described; and Sir John Jamison, in a letter published in the *Linneæan Transactions*, relates that when a man took up one of these creatures that had been wounded, it struck its spurs into his hand with such force that they could not be withdrawn until it was killed. The hand instantly swelled to a prodigious bulk, and the inflammation having rapidly extended to the shoulder, the man was in a few minutes threatened with lock-jaw, and exhibited all the symptoms of a person bitten by a venomous snake. Surgical assist-

ance was instantly procured, but it was with great difficulty that the man's life was saved. This creature inhabits the marshes of New Holland, and it forms among the beds of reeds by the water-side a nest of hair or wool and intermingled roots, in which the female is said to deposit "two white eggs, smaller than those of our domestic poultry, on which it sits, hatching them like a bird, and refusing to leave them unless threatened by a very formidable foe." The circumstance of a quadruped laying eggs appears so extraordinary that it is difficult to believe it; and yet all the researches hitherto made appear to confirm the fact.

THICK-SKINNED ANIMALS.

THE animals included in this division have neither long nails nor claws, and most of them have the extremity of the toes covered with a hard horny substance, which prevents them from using their feet for any other purposes than those of support and locomotion; while, on the contrary, those animals which are furnished with long nails or claws, use their feet to assist them in catching and tearing their food when they are devouring it. Thus, as every animal is formed expressly for the situation it is to be placed in, and for the habits which are natural to it, the thick-skinned animals, which browse on vegetable substances, are not furnished with those organs which are indispensable in beasts of prey.

THE ELEPHANT.

THE elephant, though classed with the thick-skinned animals, has not a perfect hoof; it has, indeed, five dis-

tinct toes, which are perfectly visible in the skeleton, though in the living animal they are so incrustated in a callous skin which surrounds the foot, that only their points are seen, and these seem attached to the margin of an imperfect hoof. Elephants also differ from most of the other animals in this division, in two of their teeth being prolonged into a pair of tusks, which project very far beyond the mouth, and, indeed, sometimes attain an enormous size. But the most extraordinary part of the elephant is the trunk or proboscis, which is, in fact, a prolongation of the nose or snout. It is composed of thousands of small muscles variously interlaced, so as to enable the animal to extend or contract it, or move it about in every possible direction at pleasure. It is of a tapering sub-conical form, and appears internally to consist of two tubes. On the upper side of the extremity, immediately above the partition of the nostrils, is an elongated appendage which serves as a finger; and on the under edge is a kind of tubercle which acts as a thumb. Both are endowed with the most exquisite sense of touch, and being placed at the end of an organ of such extraordinary flexibility as the trunk, which, when extended, is nearly eight feet long, it is not surprising that the elephant can with equal facility "root up trees or gather grass; raise a piece of artillery or pick up a comfit; kill a man or brush off a fly." As the mouth of the elephant is very inconveniently placed either for biting the grass or the leaves of trees, on which it generally feeds, the elephant uses its trunk to seize its food and to convey it to its mouth; and as the skin of the trunk is capable of extraordinary dilation, the elephant employs this organ to pump up enormous quantities of water, which, by its recurva-

ture, are turned into and driven down the capacious throat, or showered over the body at pleasure. Thus, the immense length of the trunk makes it supply the place not only of a hand, but "of a long neck, which would have been incompatible with the support of the large head and weighty tusks. A glance at the head of an elephant will show the thickness and strength of the trunk at its insertion; and the massy arched bones of the face, and the thick muscular neck are admirably adapted for supporting and working this powerful and wonderful instrument."

THE HIPPOPOTAMUS.

THE hippopotamus is peculiar to Africa, where it inhabits the fresh waters of the central and southern parts of that continent. Mr. Salt gives a very striking account of one he met with in Abyssinia. His attention was roused by hearing his attendants cry "Gomari," (their name for a hippopotamus,) and looking towards the river he caught a glance of an enormous creature in the water, the action of which somewhat resembled the rolling of a grampus or a porpoise in the sea. The river was about fifty yards across and very deep, and Mr. Salt and his party, stationing themselves on a high overhanging rock, waited till they saw the hippopotamus rise to the surface. In a short time they saw an enormous head raise itself above the water with a violent snort. The muskets were instantly discharged, and their contents seemed to strike directly on the forehead of the animal, "on which he turned round his head with an angry scowl, and, making a sudden plunge, descended to the bottom, uttering a peculiar noise

between a grunt and a roar." The sportsmen thought he was killed, but to their great astonishment, they found that he had only quietly descended to the bottom, where, the water being exceedingly clear, they distinctly saw him standing erect, at least twenty feet beneath the surface. After remaining five or six minutes under the water, he rose again to the surface, and the sportsmen again fired and hit him, but with no more effect than before, for the balls being only of lead were too soft to enter his impenetrable skull.

THE TAPIR.

THE tapir is a native of South America. It bears considerable resemblance to the wild boar, but it is without tusks, and has its snout elongated into a small fleshy proboscis or trunk, which, however, is so far from having the flexibility of that of the elephant, that it is incapable of holding anything, and is only used by the animal as the pig uses its snout, to search for roots buried in the ground. When pursued, the tapir seeks its safety in close and thorny thickets, which cannot affect it on account of the thickness of its skin, though they lacerate the dogs and men who generally pursue it. The tapir, like the hippopotamus, can descend to the bottom of a pond or river, and remain under water five or six minutes, without any apparent inconvenience. It is also extremely tenacious of life, as one that was shot ran for a considerable time before it fell, though, on examining its body, it was found that two balls had entered its heart.

THE HORSE FAMILY.

THE horse, the ass, the mule, the quagga, and the zebra, all belong to this family. Horses, apparently wild, are found in troops or herds in various countries, but it is said that the true wild horse is only found in central Asia; for though immense herds of horses exist apparently wild in South America, it is supposed they are all descended from some trained horses brought there by Europeans, and the reason is this: at whatever age the South American horses are caught, they may very soon be rendered fit for the service of man, sometimes, indeed, in a few days; and they rarely relapse into a state of wildness; whereas the Asiatic wild horses can only be tamed when taken young, and frequently shew themselves in after life to have been but half subdued.

The ass, in a wild state, is very different from our domestic breed. It is, indeed, a noble animal, with fine slender limbs, and a glossy skin, carrying its head loftily, and moving in a very swift and graceful manner. It appears, however, that the tame ass was reduced to servitude, and used as a beast of burden, earlier than any other animal, and it is from this degenerate race that our common domestic ass has been produced.

RUMINATING ANIMALS.

THE animals belonging to this division have a kind of double hoof, which forms what is generally called a cloven foot. Some of them, such as the ox tribe and deer, are furnished with horns, but in other respects

their general appearance bears considerable resemblance to that of the thick-skinned animals, their connecting link with which appears to be the pig, which resembles them in its cloven feet. It has been remarked, however, that all the thick-skinned animals, including the swine, have the habit, when they have lain down, of placing their fore-legs erect on the ground, before they rise on their hind-legs. The ruminating animals, on the contrary, rise first on their hind-legs, and often remain on the knees of their fore-legs for some seconds, until the hind-legs are straightened, before they rise entirely. The principal difference, however, is the singular property which the ruminating animals possess, of ruminating, or chewing the cud. All these animals are provided with four stomachs, and to understand how they operate, it is only necessary to observe how a cow takes her food. "When a cow is turned into a field, she twists her tongue round mouthful after mouthful of the long grass, and after biting each off, conveys it, without chewing, to her first stomach or paunch, till this is about half full, when the animal seems stimulated by nature to seek rest and quiet, for she leaves off eating, and either stands perfectly still in some shady place, or lies down. The paunch now exerts its extraordinary power of separating a small portion of the food it contains, and returning it to the mouth, when the animal begins slowly to masticate it, moistening it as she does so with small quantities of water, which she draws up from time to time from her second stomach, or honeycomb, in which water is retained for that purpose; and this operation is called chewing the cud. The food, when thoroughly masticated, is conveyed by another channel to the third stomach, or many-plies, where it is subjected

to muscular action ; and, finally, it is conveyed into the fourth stomach, or red bag, which contains the gastric juice, and which in calves is the part used for rennet ; and here the process of digestion is completed. Sheep, goats, deer, and camels are all ruminating animals, and are, of course, all furnished with the same apparatus for digestion ; but in sheep the paunch is smaller, as they bite close to the ground, and take smaller mouthfuls than cattle."

THE CAMEL.

CAMELS have the second stomach, or receptacle for water, much larger than any other animals, and it is the largeness of this second stomach which enables the camel to go so long without drinking, as they are equally incapable with other animals of living long without water : the only difference is, that they are



CAMELS.

provided by nature with the means of carrying water about with them. Hence it is, that in a desert the camels are generally more eager to drink when they approach water, than any other animal; and the men belonging to a caravan can tell when water is near, long before they see it, by the ungovernable impatience of the camels, which, though remarkably quiet and patient at other times, on these occasions, snuff up the air, and quicken their pace, some of them even breaking their halters. On one occasion a mounted camel was so eager, that the moment it saw water, it rushed forward to the spot, and, stumbling as it bent down its head to drink, threw its rider into the stream.

The dromedary is not a different species, as is generally supposed, but only a particularly swift kind of camel, bearing the same relation to the common camel as the race-horse does to the common horse.

THE GIRAFFE.

THE giraffe, or cameleopard, is another ruminating animal, as are the rein-deer, the elk, all the kinds of antelope, and the goat. The giraffe is so curiously formed, that if it had not been so frequently seen alive, it would be difficult to believe in its existence. The extraordinary length of the neck, the smallness of the head, and the apparent disproportion of the fore and the hind legs, are so different to the general proportions of quadrupeds, that, even when we see these animals, we can hardly fancy it possible that they can move. In a wild state, they feed entirely upon the leaves and young branches of trees, and for this mode of living their long necks and small heads are admirably adapted. Their

mode of galloping on the plains of Africa, of which country they are natives, is described as being most extraordinary, but they go so slowly that it is said that a man can go nearly as fast on foot. The live specimens that are in England appear to be very gentle and good tempered, but one of the females who had a young one, proved herself a very bad mother, as she would not suffer it to approach her, till at last the poor thing actually died for want of food.

THE ANTELOPE FAMILY.

THE antelope is a very interesting animal, and the gazelle or Barbary antelope is often mentioned by poets for the beauty of its eyes, and the general elegance of its form. The springer antelope, or spring-bock of the Dutch, is remarkable for the vast herds in which it congregates. It inhabits the plains of southern and central Africa, and migrates from one place to another, completely destroying the vegetation by its multitudes. Mr. Pringle, in one of his works, calculates that he had sometimes had not less than 20,000 of these animals in view at one time. When these antelopes migrate from one part of Africa to the other, "the lion has been observed to accompany their onward journey, walking like a grizzly tyrant in the midst of a dense phalanx of these beautiful but fearful creatures, with only as much space between him and the antelopes as the irrepressible terror of those around him could obtain by pressing outwards;" this singular procession generally continuing for a long time, since, as long as the antelopes continued together, the lion did not dare to attack them; but the moment an unhappy straggler lingered behind, the lion sprang

upon him, and carrying off his victim, left the remainder of the herd to pursue their way in peace. The smallest of the African antelopes is no larger than a rat, and it has legs no thicker than a goose's quill. These beautiful little creatures are generally brought from the coast of Guinea, but they have been found near the Cape of Good Hope.

THE OX TRIBE.

THE horned-cattle are generally divided into several species, some of which are natives of Europe, others of America, others of Africa, and others of Asia. Of the European kinds, the first is the common domestic cow. This species still exists in a wild state at two or three places in England, and at Hamilton in Scotland. They are also said to exist wild in some parts of Poland. They were formerly very abundant in Great Britain, and Fitz-Stephen, who lived in the twelfth century, speaks of the wild cattle which, in his time, inhabited great forests in the neighbourhood of London, and of which forests Kenwood, the seat of Lord Mansfield, near Hampstead, is now almost the only remains. In Scotland they were also very abundant, and we find that, in the fourteenth century, King Robert Bruce "was nearly slain by a wild bull, which attacked him 'in the Great Caledon Wood,' but from which he was rescued by an attendant, 'whom he endowed,' says Hollinshed, 'with great possessions, and his lineage is to this day called of the Turnbills, because he overturned the beast, and saved the king's life, by such great prowess and manhood.'"

The European bison, or bonasus, is a large and powerful animal, which inhabits the marshy forests and vales of Poland and Lithuania. It is also found on the Cau-

casus, and on the Carpathian mountains. It is the largest of all the European quadrupeds, measuring six feet in height at the shoulder, and ten or eleven feet in the length of the body. It has prodigious strength, and its head and neck are covered with frizzled wool, which forms a kind of beard upon the throat. Some parts of the hide have a musky smell, especially during the winter season, and hence the name of the animal is supposed to be derived from the German word *wisen*, which signifies musk.

Among the American cattle, the most remarkable is decidedly the musk ox, which is the smallest animal of the kind yet discovered, one of the largest not weighing above 300 pounds. Its flesh, even when in good condition, is coarse-grained, and smells strongly of musk. The body is covered with wool, which is of a silky nature, and from which stockings and other articles of clothing have been manufactured. The appearance of the animal is very singular, and rather resembles that of a sheep than that of any kind of cattle. The horns are remarkably broad at the base, and they cover the brow and crown of the head where they come in contact with each other. The legs are naturally short, and they are almost hidden by the great length of the hair.

The American bison, or buffalo, which is found in numerous herds on the prairies and pampas of North and South America, is another remarkable animal. Washington Irving, in his *Tour on the Prairies*, mentions that in several places he found deeply-worn foot-paths traversing the country in different directions; and these, he was informed, were the tracks of the buffaloes. These creatures have immense heads in proportion to their bodies, and the heads and shoulders are covered with

loose shaggy hair, while the hind part of the body is left perfectly bare. Each animal has a large hump, which adds to the enormous size of the fore part of the body; and as the head and chest are broad and the legs are strong, while the hind part of the body is narrow and comparatively weak, it appears evident that the creature was intended to defend itself by butting its enemies. As a confirmation of this, the head is furnished with short strong horns, which, when the animal strikes with its head, become formidable weapons.



BISONS.

“Congregating in vast herds, these animals are said to cover the wide-extended savannahs of the more southern districts of the north, for miles in extent. ‘Such was the multitude,’ say Lewis and Clarke, speaking of an assemblage of bison as they crossed the water, ‘that although the river, including an island over which they passed, was a mile in length, the herd stretched, as thick as the animals could swim, completely from one

side to the other.' The same travellers, speaking of another of these grand spectacles, say, 'if it be not impossible to calculate the moving multitude which darkened the whole plains, we are convinced that 20,000 would be no exaggerated number.' Catesby, after stating that they range in droves, feeding on the open savannahs, morning and evening, says, that in the sultry time of day they retire to shady rivulets and streams of clear water gliding through thickets of tall canes. Dr. James had an opportunity of observing them on such occasions, and he thus describes their march:—'In the middle of the day countless thousands of them were seen coming in from every quarter to the stagnant pools;' and in another place he says, that their paths are as frequent, and almost as conspicuous, as the roads in the most populous parts of the United States." The motive which guides their endless wanderings, is no doubt principally the desire for change of pasture; and, accordingly, whenever the old dry grass has been destroyed by fire, the young and tender herbage which springs up in the room of it is so agreeable to the buffaloes, that they are sure to come in great numbers to graze on it; and the hunters are so well aware of this, that they frequently set fire to the prairies, purposely, as a means of attracting the buffaloes. These creatures are generally shy, and fly from the face of man till they are wounded; but they then become furious, and pursue their enemy with a vindictive spite. In South America, these animals are found in equal abundance, and they are generally taken with what is called a lasso. The lasso, Captain Basil Hall informs us, "consists of a rope made of twisted strips of untanned hide, varying in length from fifteen to twenty yards, and about

as thick as the little finger. It has a noose or running knot at one end, the other extremity being fastened by an eye and button to a ring in a strong hide belt;" and this belt is bound tightly round the horse on which the Indian rides. It must be observed, that the native inhabitants of the Pampas of South America, who are called Guachos, may be almost said to live on horseback, for they never move a hundred paces from their habitations without mounting a horse, one ready saddled always standing before the door. "A Guacho is clad in the *poncho*, which is manufactured by the women. It is about the size and shape of a small blanket, with a slit in the centre to admit the head. It, therefore, serves to keep out the wet and wind, and leaves the arms at perfect liberty. The jacket of the Guacho resembles the jackets worn by the Spanish peasantry, and is made of coarse cloth or baize, or of velveteen; his breeches, made of the same materials, are open at the knees. His leggings are composed of horse-hide, and his toes are left bare. A straw hat, with a cotton handkerchief tied round his face, complete his dress." When the lasso is to be used, the Guacho gathers it up into a coil before he discharges it. "The coil is grasped by the horseman's left hand, while the noose, which is held in the right hand, trails along the ground, except when in use, and then it is whirled round the head with considerable velocity, during which, by a peculiar turn of the wrist, it is made to assume a circular form, so that when delivered from the hand, the noose preserves itself open till it falls over the object at which it has been aimed."

The Gauchos are also armed with another instrument called the bolas. This instrument is composed of a

piece of string or leather thong with a round stone at one end ; or instead of a stone, balls of hardened earth, iron, copper, or lead. These balls are connected with one another by thongs equal in length, the ends of which are united. "Taking one ball in the right hand, the other two are whirled round several times, and the whole then thrown at the object to be entangled. They do not strike the objects with these balls, but endeavour to throw them so that the thong shall hit a prominent part, and then, of course, the balls swing round in different directions, and the thongs become so twisted, that struggling only makes the captive more secure. A powerful missile is formed of a single ball, similar in substance and size to the others, but attached to a slighter rope about a yard long. Whirling this ball, about a pound in weight, with the utmost swiftness round his head, the Guacho dashes it at his adversary with almost the force of a shot. At close quarters it is used with a shorter scope of cord as a very efficient head-breaker." "It is astonishing with what dexterity the Guachos use both the bolas and the lasso, on horseback and at full gallop, and how they hit with unerring precision the object aimed at." "Even when standing still," Captain Hall observes, "it is by no means an easy thing to throw the lasso ; but the difficulty is vastly increased when it comes to be thrown from horseback and at a gallop, and when, in addition, the rider is obliged to pass over uneven ground, and to leap hedges and ditches in his course." "Yet such is the dexterity of the Guachos, that they are not only sure of catching whichever animal they please, but they can fix their lasso on any part of the animal they like ; as, for example, they can either throw it over the horns, or the

neck, or the body, or any one of the legs they please, with such ease and dexterity that it appears like magic. This extraordinary dexterity can only be gained by the arduous practice of many years. It is, in fact, the earliest amusement, as well as business, of these people; for I have often seen little boys just beginning to run about, actively employed in lassoing cats, and entangling the legs of every dog that was unfortunate enough to pass within reach. In due season they become very expert in their attacks on poultry, and afterwards in catching wild birds; so that by the time they are mounted on horseback, which is always at an early age, they begin to acquire that matchless skill from which no animal of less speed than a horse has the slightest chance of escaping." When a wild bull is to be caught and killed by two Guachos, the men dash off at full gallop, each swinging his lasso round his head. "The first who comes within reach aims at the bull's horns, and when he sees, which he does in an instant, that the lasso which he has thrown will take effect, he stops his horse, and turns it half round, the bull continuing his course till the whole cord has run out. The horse, meanwhile, knowing by experience what is going to happen, leans over as much as he can in the opposite direction from the bull, and stands trembling in expectation of the violent tug which is to be given to him by the bull when brought up by the lasso. So great, indeed, is the jerk which takes place at this moment, that were the horse not to lean over in the manner described he would certainly be overturned; but standing as he does across the road, with his feet planted firmly on the ground, he offers sufficient resistance to stop the bull as instantaneously as if it had been shot, though the instant

before he was running at full speed. In some cases, this check is so abrupt and violent, that the animal is not only dashed to the ground, but rolls along at the full stretch of the lasso; while the horse is drawn sideways, and ploughs up the earth with his feet for several yards. This, which takes so long to describe, is the work of a few seconds; during which the other horseman gallops past, and, before the bull has time to recover from the shock, places the noose over his horns, and continues advancing till this lasso also is at full stretch. The bull, stupified by the fall, sometimes lies motionless on the ground; but the men soon rouse him up by tugging him to and fro. When on his legs, with a horseman on each side, he is like a ship moored with two cables; and however unwilling he may be to accompany the Guachos, or however great his struggles, he is irresistibly dragged along by them in whatever direction they please."

The Cape buffalo also congregates in large herds. Thunberg and his companions came suddenly upon a mass of 500 or 600, which were grazing in a plain skirted by a wood. The beasts did not see the intruders till they came within 300 paces, when the whole herd lifted their heads and stood to gaze. On another occasion, an old male buffalo attacked a man on horseback, and gored the horse so furiously in the breast that his horns actually came out through the saddle. The horse, of course, was killed, and the man was so terrified that he could not speak for some days after; and, indeed, had not power to kill the buffalo, though it would have been easy to do so while the creature was entangled with the dead horse. Two other horses which were near were discovered shivering with fear, unable to

make their escape. The Cape buffalo delights in wallowing in the mire, and, when heated by hunting, he throws himself into the first water he reaches. The hide of this animal is remarkably tough, and its horns grow to an enormous size.

The Indian ox, or zebu, is supposed to be only a variety of the common ox. There are several subvarieties, the colour of which varies from a light ashy-grey to a milk-white, and their size from that of a large mastiff to that of an ordinary bull. The greatest peculiarity, however, is, that they all possess a large hump below the neck and over the shoulders, and this hump is considered remarkably good to eat, though the general flesh of the animal is harder and drier than that of the common ox. In many parts of India, the zebu is used like a horse, either for riding or in a carriage. "The zebus bear a charmed life among the Hindoos, who venerate them, and hold their slaughter to be a sin; though they do not object to work them. There are, however, some particularly sanctified zebus who lead an easy life, wandering about the villages at their ease, and taking their pleasure and their food where they list, if not prevented by the contributions of the devout."

The yack, or grunting ox, is only found in Tartary, and in a part of Thibet. Its popular name alludes to the noise it makes, which exactly resembles the grunting of a pig. It has a hump, though not so high as that of the zebus, and its back is covered with hair mixed with wool, the hair being particularly long on the tail. The tails of these animals, indeed, under the name of horse tails, are used as standards by the Turks and Persians. The chowries or fly-drivers, made use of in India, are likewise formed from the tail of the

grunting ox ; and it is dyed red by the Chinese, who wear it as a tuft in their summer bonnets.

CETACEOUS ANIMALS, OR THE WHALE TRIBE.

THERE are, perhaps, no other animals that have given rise to such wild fictions as these ; for though so common as to be often seen, their habits are so extraordinary, and so different from all our preconceived notions, that they seem quite beyond the verge of probability. The idea of creatures resembling fishes and living in the sea, and yet nourishing their young at the breast, and in some cases coming on shore to eat grass, appears such an assemblage of incongruities, that it is not surprising that some of the species were supposed by our earliest voyagers to be supernatural beings, and that they were called tritons, mermaids, and sirens, while even now the grass-eating species are known by the names of sea-calves and sea-cows. Until the beginning of the present century, the grass-eating cetacea were often confounded, even by naturalists, with the seals, or sea-dogs, and the walrus, or sea-horse ; but from these they differ essentially in having no hind-legs or feet, and, in fact, having the hinder part of the body exactly like that of the whale. Thus formed, they live entirely in the water, though they do not feed on fish, but live solely on vegetables which they find in the shallow parts of the sea, and on the banks of estuaries and rivers. “ There can be no doubt that these creatures formed the type of those ideal objects of ancient poetry, the tritons, half men and half fish, who had power to calm the stormy surge ; and probably, too, of the sirens, those sea-nymphs whose melody charmed the entranced voyager to his destruc-

tion and death." This strange belief is said to be still entertained by the inhabitants of the Shetland Islands and the extreme north of Europe; and a modification of these fables is firmly believed in by the peasants in some of the wilder parts of Ireland. The number of stories that are extant in these countries, of mermaids and mermen, all refer to the same creatures, or to seals; and there is no doubt that many of the persons who related these stories, merely told what they believed they saw, the imagination giving a slight colouring to the wonders of the reality. The imagination, however, must have exercised a powerful influence over the minds of those who fancied that the mermaids sang delightfully, as the sounds uttered by these sea-monsters are the most dismal and melancholy that can be imagined.

There are three distinct genera of the grass-eating whales; the first is called *Manatus*, the manatee of the West Indies; the second is *Halicore*, the dugong of the East Indies; and the third, which is called *Stellerus*, is an inhabitant of the Polar regions.

The *Manatus* is never found in deep waters. It frequents the shallow bays among the West Indian islands, and the mouths of the vast rivers the Orinoco and the Amazon; and in these innumerable flocks of the manatee generally dwell. They also ascend the fresh waters for many hundred miles. When these creatures are attacked, they associate in troops, placing the young in the centre, as if to preserve them from all harm, and when one has been wounded, they do not drive it away from them, as is the case with most other animals, but surround it, appearing to try to give it all the help in their power; they are said even to try to extract the

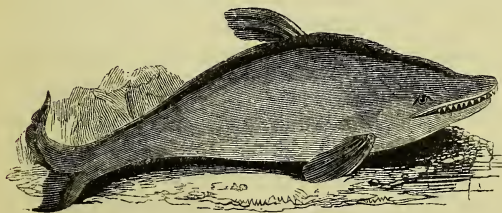
weapon with their teeth. One that was taken young was reared and kept in a lake at St. Domingo, and preserved for the long period of six-and-twenty years. It was quite tame, and would come to its name when called.

The dugong is very curiously formed. The head is very small, and the nostrils are so constructed that the animal can close them with a kind of valve when it is feeding at the bottom of the sea. The eye is also very small, and it is supplied with a third eyelid; while the aperture of the ear is so minute, that it is with difficulty perceived. The upper lip is large, forming a vertical kind of snout; and to correspond with this curious formation, the upper jaw is bent downwards almost at a right angle, while the lower jaw appears cut off so as to fit into the upper one. This very extraordinary animal does not come on shore for its food, but lives on the seaweeds which it finds at the bottom of the inlets of the ocean; and it browses on these vegetables precisely as a cow eats grass in a meadow. It is interesting to see, by the skeleton of this creature, how beautifully it is constructed, so as to enable it to balance its body, though unsupported by legs, over the weeds on which it feeds. It resides generally at the bottom of the sea, but it is obliged to rise every now and then to respire. Its flesh resembles young beef, and is very delicate and palatable. Sir Thomas Stamford Raffles wrote a very interesting memoir on this creature from Sumatra; and, among other things, he mentions that the Malay women are very anxious to secure its young, as they always shed tears for the loss of their mother, and these tears, if preserved, are an infallible charm to recover lost affections. The mother is also devotedly attached to her

young, and she is said to follow them even through a crowd of people. "This idea," says Sir T. S. Raffles, "is as poetical as the fable of the siren's song." There is one species of these animals found in the Red Sea, and it is supposed to be the creature with whose skin the Jews of old were compelled by the Mosaic law to veil their tabernacle.

The steller is, as yet, but little known; and the first specimen that was seen, was mistaken for a floating tree, its skin being excessively black and knotty. In fact, according to Cuvier, the epidermis or outer skin is a kind of bark, composed of fibres or tubes, so closely packed together, that the animal is completely clad in a substance similar to the hoofs of cattle. This hide is an inch thick, and so hard as scarcely to be cut through with an axe, and where cut, it looks like ebony. The skin is very useful to the animal during winter, in protecting it against the ice and the sharp-pointed rocks on which it is frequently dashed, and in summer in shielding it from the rays of the never-setting sun. The lips are double, that is to say, there are external and internal lips; and when approximated, the space they circumscribe is filled by a thick mass of strong bristles, which are white, and an inch and a half long. "These bristles in their nature, and still more in their functions, agree with the baleen or whalebone of the whales, serving as a sieve through which they can strain off the water which they swallow with their food, whilst they retain the food itself. The masticating apparatus is not less singular, and seems peculiar to this animal. The creature has no teeth, but instead of them it is furnished with two large white horny substances, one in the upper and the other in the lower jaw, which are not inserted

in the jaws, but adhere to them by numerous projections and cavities. The horny substances themselves, when examined, are found not to be solid, but to consist of innumerable tubes. The heart is also very curious, as it is double." The stellers are most voracious creatures, and feed with their heads under water, quite inattentive to boats or whatever else may be passing over them. They swim gently, one after another, sometimes with a great portion of the back out of the water, and every now and then they elevate their muzzles for the sake of respiration, making a noise like the snorting of a troop of horses. One was captured at Behring's Island, by a great hook fastened to a long rope, the boat containing the captor being rowed amidst the herd. When the animal was struck, the rope was conveyed on shore, where about thirty people took hold, and drew it on shore with great difficulty. The poor creature made the greatest resistance, assisted by its faithful companions, and it clung to the rocks with the greatest pertinacity.

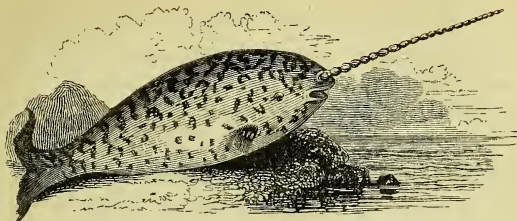


THE DOLPHIN.

The true dolphins are very numerous, and they have all beak-like snouts, which circumstance accounts for the dolphin's French name of "goose of the sea." Many

curious legends were told by the Greeks of the dolphin, but they are so little like the real creature and its habits, that they probably refer to some other marine animal. The bottle-nosed whale, the swift dolphin, and the porpoise, which is well known on the British coast, are all nearly allied to the dolphin, as is the grampus, or thrasher, which has the character of being so exceedingly voracious and warlike, that, when six or eight are assembled together, they will attack a Greenland whale, and during the battle that ensues, they are said to resemble "so many furious mastiffs fighting a wild bull, some seizing the tail, and endeavouring to impede its murderous blows, while others attack the head, and lay hold of the lips, or tear away the tongue." The round headed porpoise, or ca'ing whale, is remarkable for being found in flocks of 200 or 300, or even more, and, as remarked by Dr. Neill, the main body of these whales will follow a leader, as a flock of sheep will a wedder; "hence the natives of Shetland well know, that if they are able to take the leaders, they are sure likewise of entangling multitudes of their followers. This trait is strikingly illustrated by a circumstance of which Dr. Traill was a witness. 'I once,' says he, 'was in a boat when an attempt was made to drive a shoal of these animals ashore; but when they had approached very near the land, the foremost turned round with a sudden leap, and the whole rushed past the boat.'"

The narwhal, or sea unicorn, is a very singular creature, which has a single tusk, or horn, as it is called, instead of teeth. Sometimes two tusks are produced, but generally there is only one, and that is usually found on the left side. The tusk or horn has usually



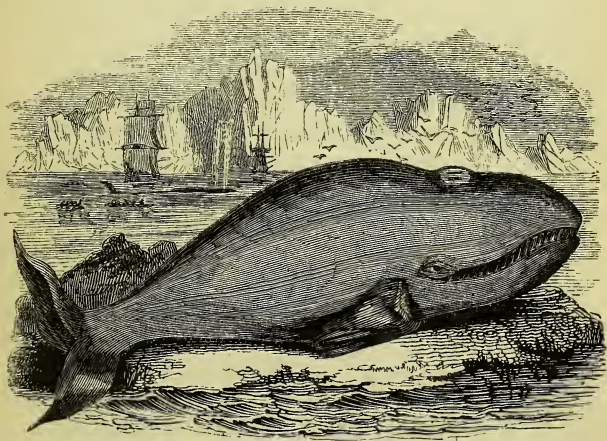
THE NARWHAL.

spiral markings, and the ivory of which it is composed is even better than that of the elephant. There is another curious creature, nearly allied to the narwhal, called the Aodon, which has a sharply-pointed beak like a bird.

Of the true whales, one of the most curious is the cachalot, or sperm whale. This creature is seventy or eighty feet long, and its head is so large, that it is generally supposed to be about a third of the whole body. The cavity in the upper part of this enormous head is divided into cells filled with oil, which is fluid when the animal is alive, but which, after death, becomes what we call spermaceti. The blubber or fat on the breast of a large whale of this kind is about fourteen inches thick, but it is somewhat thinner in the other parts of the body. This fat, when melted down, yields what is generally called sperm oil. The throat of this whale is generally large enough to swallow the body of a man, and in this respect it is very different from the Greenland whale, the throat of which is so remarkably small, that it is generally said it would be choked by a penny roll. According to Mr. Beale, in his *Observations on the Natural History of the Sperm Whale*, "the peculiarity of this

whale, which strikes every beholder, is the unwieldy bulk of the head; but this, instead of being an impediment, is conducive to its agility, for the greatest part of it containing oil, the head receives a tendency to rise so far above the surface, as to elevate the blow-hole for the purposes of respiration; and should the animal wish to increase its speed to the utmost, the narrow lower portion of the head, which bears some resemblance to the cut-water of a ship, is the only part exposed to the resistance of the water; and it is thus enabled to press its ponderous way, with the greatest ease, along the ocean." The sperm whale is distinguished from its congeners by its blowing. If the water is smooth, the first part observed is the hump, projecting two or three feet above the surface. At very regular intervals of time, the snout emerges, at the distance of about forty or fifty feet from the hump; and from the extremity of the snout a jet is thrown up, which, when seen from a distance, appears thick, low, bushy, and perfectly white. This kind of whale has several peculiar motions, one of which is what is called sweeping; and it consists in moving the tail slowly over the surface of the ocean, as if feeling for any object that might be near. Another is, the mode which it has of rolling over and over on the surface of the water, particularly after it has been harpooned, in which case it will sometimes coil an amazing length of rope around it; but one of its most surprising feats is leaping completely out of the water, a practice which is often attended by dangerous results to those around. The way in which this is effected is, by the whale descending to a certain depth in the water, and then making several powerful strokes with its tail, so as to impart a great velocity to its body before it reaches

the surface, when it darts completely out of the water. It sometimes does this two or three times in quick succession, upsetting the boats, and doing various other mischief in the course of its evolutions. Ambergris is sometimes found in the intestines of this whale, but the principal value of the animal arises from the spermaceti found in its head.



THE GREENLAND WHALE.

The Greenland or common whale varies from sixty to a hundred feet in length. Its head is very large, and its mouth, instead of teeth, contains two extensive rows of baleen, commonly called whalebone, which are suspended from the upper jaw and sides of the mouth. "The plates are generally curved longitudinally, and give to the roof of the mouth the form of an arch. They enclose the tongue between their lower extre-

mities, and are themselves covered by the lower lip. There are upwards of 300 of these plates on each side of the jaw; they are longest in the middle, whence they gradually diminish away to nothing both in front and behind. The tongue is incapable of protrusion; and the throat is remarkably narrow, not exceeding an inch and a half in width. The colour of the true whale is mostly velvet black, with white in some parts underneath, and a tinge of yellow. The blubber, constituting the most valuable part of the animal, forms a complete wrapper round the whole body from eight to ten inches thick under the skin, or rather forming the inner coating of the skin." The Greenland whale is frequently seen on the surface of the water, apparently asleep, but when attacked it sinks rapidly. "Mr. Scoresby has observed a whale descending, after it had been harpooned, to the depth of a quarter of a mile, at the rate of seven or eight miles an hour. When not attacked, however, whales swim slowly, seldom exceeding four miles an hour. Sometimes they leap entirely out of the water, and sometimes they throw themselves into a perpendicular position, with their heads downwards, and, waving their tremendous tails high in the air, beat the water with awful violence, the sound reverberating to the distance of two or three miles." This is called lob-tailing, and it frequently occasions tremendous destruction among the boats. Whales never remain in the water longer than twenty minutes, and seldom more than ten, without rising to the surface to breathe; and when they rise, they generally blow eight or nine times, the head remaining above the surface about two minutes. The manner in which these enormous creatures are fed, may well be called one of the wonders of creation. They have no teeth, and

hence they cannot prey on other animals of their own kind, or on fishes, and the throat is so narrow, that they would be suffocated if any large object were to enter the mouth. Hence they have been mercifully provided with their whalebone strainers, which only permit shrimps and other small crustacea, on which the whale generally feeds, to enter. "When the whale wishes to feed, it swims with considerable velocity below the surface, with its jaws widely extended. A stream of water consequently enters its mouth, and along with it large quantities of minute crustaceous and molluscous animals; the water flows out again at the sides, but the food is entangled with the baleen or whalebone, which, from its compact arrangement and thick internal covering of hair, does not allow a particle to escape, even of the size of the smallest grain." These whales are generally found either solitary or in pairs, except in particular situations, or where there is a great abundance of food.

There are several other kinds of whale, but those which have been mentioned are the most important. Before, however, concluding the account of these remarkable creatures, it may be well to revert to a few of their peculiarities, particularly to the difference between them and fish. Fish are produced from spawn, and after the lapse of weeks or months, emerge from their slimy beds of weed or gravel, where they had long lain neglected by their oblivious parents, who never notice their young: "but whales are brought alive into the world, and the cub is nourished for months by its mother's milk, and disports itself around her in playful affection, gambolling through the green translucent sea, like the fawn or the lambkin rejoicing in their sunny glades." Fish, again, are cold-blooded, while the blood

of the cetacea is warm; and, finally, fish never breathe, and if removed from the water and brought into the air, they soon die, whereas the cetacea, if deprived of air by being kept below the surface of the water, would soon be literally drowned. It may seem odd to talk of drowning a whale, but if a weight were tied round it so as to prevent it from rising to the surface to breathe, it might be as easily drowned as a dog. The manner in which the fat is disposed between the body and the skin is admirably suited for creatures destined to spend the greater part of their lives in seas partially covered with ice; as the fat, being a bad conductor of heat, prevents the warmth of the body from escaping, and the creature from being chilled in places where any other warm-blooded animal, not provided with such a covering, would perish from cold. As the cetacea, though they are obliged to breathe in the open air, feed below the water, they are provided with a peculiar kind of wind-pipe, so that the creature may breathe when its mouth is full of water without there being any danger of the water rushing with the air into the chest. In short, it is impossible to contemplate these wonderful and enormous creatures without being tempted to exclaim with the Psalmist, "O Lord, how manifold are thy works! in wisdom hast thou made them all." "They that go down to the sea in ships, that do business in great waters; these see the works of the Lord, and his wonders in the deep."

CHAPTER II.

BIRDS.

BIRDS may be scientifically defined as vertebrated oviparous, or egg-producing, animals, covered with feathers and organised for flight. The bill supplies the place of lips and teeth; the organs of smell and hearing are perfect; and the eyes, which are generally very keen, are protected by a membrane which serves instead of eyelids. The birds of prey have remarkably strong thick legs, furnished with claws, and they have generally a curved bill which possesses great strength. The birds which are intended for rapid flight have small light bodies and very slender legs, but they have powerful wings. Those which live on fish have long slender legs and long necks to enable them to wade in the water and take their prey without wetting their bodies; and those which are regularly aquatic fowls are furnished with webbed feet, which act as paddles and enable them to swim on the surface of the water. In short, the adaptation of every creature to the situation it is designed to fill is as beautifully shewn in birds as in animals; and when we notice the variety of form and plumage which has been given to these creatures, and see how distinctly the peculiar properties of each kind are preserved through all these changes, we cannot fail to be forcibly impressed with awe and admiration at the wisdom and beneficence of that Almighty Being who has formed both the vulture and the dove.

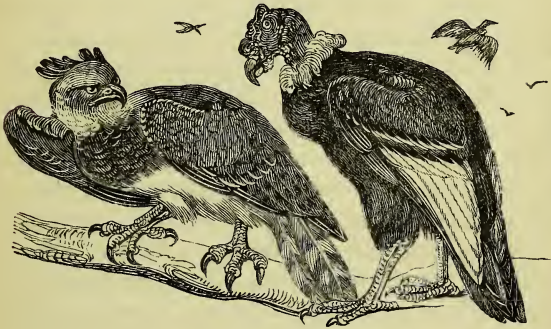
BIRDS OF PREY.

THE raptorial birds, or birds of prey, are all furnished with a strong sharply-pointed beak, which is always hooked at the extremity of the upper bill. Their legs, which are rather short, are very strong, and their feet have four toes, furnished with strong, sharp, curved claws, with which the creature can take hold of anything when he is tearing it to pieces with his beak. All these birds live on animal food, and they generally prefer living prey. They are still more fierce than the beasts of prey, and their powers of flight are as remarkable as their strength. Their forms are often graceful, and their eyes particularly brilliant; but their voices are generally harsh and unmusical. They are divided into two kinds, which are called diurnal and nocturnal, according to the time at which they take their flight.

Diurnal Birds of Prey.—Vultures are amongst the fiercest of these birds; and as most of the kinds are particularly fond of carrion, they have been called Nature's scavengers. The true vultures are only found in the Old World. Their flight, though slow, is powerful, and long sustained. They rise, whirling round and round, to a great height in the air, and descend in a similar manner. They build among inaccessible rocks; and of the two kinds known in Europe, the nest of the grey vulture has never yet been met with.

The American vultures are remarkably large and fierce; and the most interesting among them are the king vulture and the condor of the Andes. The condor is supposed to ascend to a greater height in the atmosphere than any other living creature. Humboldt, in-

deed, has calculated that it will ascend perpendicularly to the height of six miles ; “and to this vast height,” as he expresses it, “the condor is seen majestically sailing through the ethereal space, watchfully surveying the airy depth in quest of his accustomed prey.” The eyries or nests of the condor are generally about 15,000 feet above the level of the sea. “There, perched in



CONDOR AND HARPY EAGLE.

dreary solitude, on the crests of scattered peaks, at the very verge of the region of perpetual snow, these dark gigantic birds are seen silently reposing like melancholy spectres.” The condor is accused of attacking children and carrying them off to its nest ; but this is incorrect, as it is proved by naturalists to be incapable of holding any heavy weight in its claws. It makes no nest, but lays its eggs on the bare earth. It feeds principally on dead animal matter, and though its usual station is on the peaks of the mountains, it sometimes descends to feed among the plains and valleys. On these occasions it is sometimes seen, first, as a mere speck in the

clouds, and then growing larger and larger as it descends, till at last it pounces upon its prey. When the condor is feeding, it appears quite absorbed and heedless of everything around it; and it seems so careless where the prey is, that a female, now in the French Museum, was found at sea sitting on the dead body of a floating whale. The condor is a large bird, from three to four feet in length, with an extent of wing sometimes reaching from ten to twelve feet. "In riding along the plain," says Sir Francis Head, "I passed a dead horse, about which were forty or fifty condors: many of them were gorged and unable to fly; several were standing on the ground devouring the carcass; the rest hovering above it. I rode within twenty yards of them; one of the largest of the birds was standing with one foot on the ground, and the other on the horse's body: the display of muscular strength as he lifted the flesh, and tore off great pieces, sometimes shaking his head and pulling with his beak, and sometimes pushing with his leg, was quite astonishing." The next morning Sir Francis was informed that after he had passed a contest had taken place between one of his men and a condor. The man, who was a Cornish miner, had a great desire to possess one of these birds, and perceiving that one of them seemed completely gorged, he jumped off his horse and seized the bird by the neck. "The contest was extraordinary, and the rencontre unexpected. No two animals can well be imagined less likely to meet than a Cornish miner and a condor; and few could have calculated a year ago, when the one was hovering high over the snowy pinnacles of the Cordillera, and the other many fathoms beneath the surface of the ground in Cornwall, that they would ever meet to

wrestle and hug upon the wide desert plain of Villa Vicencia. My companion said he never had such a battle in his life; that he put his knee upon the bird's breast, and tried with all his strength to twist its neck, but that the condor, objecting to this, struggled violently; and also, as several others were flying over his head, he expected they would attack him. He said that at last he succeeded in killing his antagonist; and, with great pride, he shewed me the large feathers of the wings;" but the struggle had evidently been a most severe one.

The king vulture is a very ornamental species, the fleshy portions of its head and neck being red, orange, and purple; the collar at the base of the neck bluish grey; the quill feathers and tail black; and the under part of the body white. It derives its name of the king vulture from its habit of driving away the turkey buzzard, or common vulture of the Americans, in a very tyrannical manner from its prey; so that it should rather have been called the tyrant vulture, than the king.

It was long doubted by some naturalists whether the turkey buzzard, or common American vulture, found its prey by the sight or by the smell; but Mr. Waterton, who is decidedly our first British ornithologist in all that relates to the habits of birds, has ascertained that it has keen powers of scent; and a curious circumstance is related in Gosse's *Birds of Jamaica*, which illustrates the subject. The poultry-yard of the barracks of St. Andrews had been repeatedly robbed, and on the night of January the 20th, 1840, the dogs belonging to the barracks flew upon a man, who was going along the road, so vehemently, that the soldiers lodged him in the guard-house. Two days after his apprehension

on suspicion, and when he was about to be discharged for want of sufficient evidence, the major belonging to the barracks "observed some carrion vultures hovering about a spot in the fields, and on sending to see what was the matter, a Kilmarnock cap, containing a dead fowl and some eggs, tied up in a pair of old trousers, was found very near the spot where the prisoner was caught;" and as the clothes were proved to be his, the vulture was, in this case, decidedly the means of the crime being brought home to him.

The lammer-geyer of the Alps is nearly allied to the vultures, and it is supposed to be the same as the Father Long-Beard mentioned by Bruce in Abyssinia. "On the loftiest summit of the mountain of Lamallon, while the travellers' servants were refreshing themselves after the fatigues of a toilsome ascent, and enjoying the pleasures of a delightful climate, and a good dinner of goat's flesh, a lammer-geyer suddenly made his appearance among them. A great shout, or rather cry of distress, attracted the attention of Bruce, who, while walking towards the bird, saw it deliberately put its foot into a pan which contained a huge piece of meat which was boiling for the men's dinner. Finding the temperature, however, somewhat higher than it was accustomed to among the pure gushing springs of that rocky and romantic region, it suddenly withdrew its foot, but immediately afterwards settled upon two large pieces of flesh which lay upon a wooden platter, and transfixing them with its talons, carried them off."

The falcon family are remarkable for velocity of flight. A falcon sent from Andalusia back to its home in the Canary Islands, was found in Teneriffe sixteen hours after it had taken its flight from Spain, the dis-

tance being not less than 752 miles; and a falcon belonging to Henry II. of France, which made its escape from Fontainebleau, was retaken the next day in the Island of Malta, where it was recognized by the rings on its legs, having made the journey at the rate of at least seventy-five miles an hour.



THE GOLDEN EAGLE.

Eagles are, however, the most magnificent of all the birds of prey. The golden eagle, which inhabits the Alps, is one of the most magnificent of the tribe; and this noble bird, which is occasionally found in Scotland, is abundant among the pine-clothed hills of Norway.

The sea eagle is an exceedingly magnificent bird in appearance, but the American species is cowardly in its habits, and is said to prefer the labours of others to its own. "Elevated," says Wilson, "on the high dead limb of some gigantic tree that commands a view of the neighbouring shore and ocean, he seems calmly to contemplate the motions of the various feathered tribes that pursue their busy avocations below, till at last, high over the rest, hovers one whose action instantly arrests his whole attention. By its wide curvature of wing and sudden suspension in the air, he knows the new comer to be the fish-hawk, settling over some devoted victim of the deep." The fish-hawk darts into the water, the clapping of its wings reaching the ear as it disappears in the deep, and makes the surges foam around. In a moment the fish-hawk emerges, struggling with its prey: but as it mounts into the air it is chased by the sea-eagle, each exerting its utmost to mount above the other. The eagle being unencumbered, rapidly gains upon the fish-hawk, which, just as its opponent reaches him, with a sudden cry of despair drops his fish, which the eagle snatches ere it reaches the waters, and bears away to his nest.

The harpy is a large bird of prey belonging to the eagle family which dwells chiefly in the forests of Guiana, making its nest on a tree, and carrying off young fawns and sloths of a year's growth with the utmost ease. This creature is said to be capable of cleaving a man's skull by a single blow of its beak.

The chicken-hawk is a kind of buzzard, and in Gosse's *Birds of Jamaica*, a curious instance is mentioned of the care which the female of this rapacious bird takes of her young. A large nest was observed near the top of an

immense cotton tree, into which the old birds frequently entered. The gigantic dimensions of the tree, and the smoothness of its trunk, rendered it very difficult to examine the nest. At length, however, two young birds were observed to emerge from it, and to try their powers of flight. The gentleman who has recorded this circumstance relates, that "he distinctly saw the parent bird, after the first young one had flown a little way, and was beginning to flutter downward,—he saw the mother, for the mother surely it was,—fly beneath it, and present her back and wings for its support. He cannot say that the young actually rested on, or even touched the parent;—perhaps its confidence returned on seeing support so near, so that it managed to reach a dry tree—when the other little one, invited by the parent, tried its infant wings in like manner. This touching manifestation of parental solicitude is used by the Holy Spirit in the Song of Moses, to illustrate the tenderness of love with which Jehovah led his people Israel about, and cared for them in the wilderness. 'As an eagle stirreth up her nest, fluttereth over her young, spreadeth abroad her wings, taketh them, beareth them on her wings; so the Lord alone did lead him, and there was no strange God with him.'—(Deut. xxxii. 12. See also Exod. xix. 4.)"

The African sparrow-hawk, which is extremely rapacious, is the only bird of prey which is gifted in any way with the power of song. It is popularly called the chanting-falcon; and in its native country it will sit for half-a-day perched on the summit of a tall tree, uttering its incessant but monotonous song.

The secretary, or serpent-eater, of Southern Africa, is sometimes also called the messenger, because it runs

with great rapidity, as if it were in a violent hurry; and its name of the secretary alludes to its having a pen-like plume behind its ear. Its most suitable name, however, appears to be the serpent-eater, as it lives on serpents, which it attacks in a manner very different to most other birds of prey. "When he falls upon a serpent," Mr. Bennet observes, "he first attacks it with the bony prominences of his wings, with one of which he belabours it, while he guards his body by the expansion of the other. He then seizes it by the tail, and mounts with it to a considerable height in the air, from which he drops it to the earth, and repeats this process until the reptile is either killed or wearied out; when he breaks open its skull by means of his beak, and tears it in pieces with the assistance of his claws, or, if not too large, swallows it entire." "It is interesting," Mr. Bennet mentions in another place, "to observe how admirably this creature is fitted by his organisation for the destruction of the snakes and other reptiles on which he feeds. The length of his legs not only enables him to pursue these creatures over the sandy deserts which he inhabits, with a speed proportioned to their own, but also places his more vulnerable parts in some measure above the risk of their venomous bite; and the imperfect character of his talons, when compared with those of other rapacious birds, is in complete accordance with the fact, that his feet are destined rather to inflict powerful blows than to seize and carry off his prey."

The Nocturnal Birds of Prey are almost confined to the owl family, all of which are distinguished by a very peculiar physiognomy which is rendered more conspicuous by a circle of feathers which surrounds the head. The bill is curved almost from the base; the eyes are

large, and furnished with a peculiar membrane; and the legs and feet, even the toes, are covered with short downy or hairy feathers, the claws being extremely sharp. The plumage is remarkable for its great softness. The ears are large, and the sense of hearing remarkably acute. The flight of all the owl family is light and buoyant, and performed by slow, but regular flapping of the wings. Owls are generally solitary; and as they are only seen at night, there is something ghost-like in their slow, noiseless flight, which imparts to them a kind of unearthly character, and no doubt has occasioned the superstitious feelings with which they are generally regarded. "There is something," says Wilson, "in the character of the owl so recluse, solitary, and mysterious, something so discordant in the tones of its voice, heard only amid the silence and the gloom of night, and in the most lonely and sequestered situations, as to have strongly impressed the minds of mankind in general with sensations of awe and abhorrence of the whole tribe. The poets have indulged freely in this general prejudice; and in their descriptions and delineations of midnight storms, and gloomy scenes of nature, the owl is generally introduced to heighten the horror of the picture."

If such are the feelings with which the owls of Europe are regarded, what must be the sensations caused by the great horned owl of America? which is not only much larger and stronger, but has an expression of ferocity in its countenance, which is really enough to excite terror. The favourite residence of this owl, according to Wilson, is the darkest solitude of a deep swamp, covered by a growth of gigantic timber, from which, so soon as evening darkens, and the human race retire to rest, he

sends forth his unearthly hootings, starting the way-worn traveller by his forest fire, and "making night hideous." Among the noises made by this owl, there is one extremely unpleasant, which very strikingly resembles the half suppressed screams of a person suffocating, or being throttled, and the horror of this noise in a lonely forest, where it conveys the idea of some person being murdered, may be very easily conceived.

The burrowing owls are, however, perhaps the most singular species of the genus. They can hardly be called nocturnal birds, as they fly by day, and seem to enjoy the broadest glare of the sun; but they live in the burrows of the marmot, taking shelter under ground when pursued.

PERCHING BIRDS.

THIS is a very numerous family, and the birds belonging to it are generally perfectly well known, as they are those which we are in the habit of seeing every day in our gardens or about our houses. They include, indeed, all the soft-billed birds, which feed principally upon worms and insects, and many of which are delightful songsters.

The most remarkable of the perching-birds is, perhaps, the grey shrike, or common butcher-bird, which generally destroys its prey by strangulation; and transfixing it after death upon a thorn, tears it into smaller parts at leisure. Mr. Selby witnessed this operation of the shrike upon a hedge-sparrow, which it had just killed. In this instance it hovered, with its prey in its bill, for a short time over the hedge, till it had selected a thorn fitted for its purpose. "On disturbing it," continues Mr. Selby, "I found the sparrow firmly fixed by

the tendons of the wing to the selected twig." On other occasions mice and other small quadrupeds have been found transfixed in a similar manner. The lesser shrike, which lives only on insects, kills and hangs up to dry so many more than it devours, that the hedge it inhabits looks almost like a Liliputian butcher's shambles.

What is called the black shrike is not uncommon in the mountain districts of Jamaica, where, Mr. Gosse informs us, from "the remarkable diversity in the appearance of the male and female, they are known by separate local names: the black male is known by the feminine appellation of Judy; while the chestnut-headed female receives the masculine sobriquet of Mountain Dick." The song of these birds is very peculiar, and is very commonly heard from the male and female alternately, seated on two trees, perhaps on the opposite sides of a road. Mountain Dick calls and Judy immediately answers; then there is a little pause, which is followed by a call from Mountain Dick, and an instant answer from Judy, and so on. The call is very peculiar, and consists of seven or eight notes, uttered as quickly as possible, and then ending in one long, low note. These birds fight vigorously when taken, and one which was slightly wounded, on being taken by Mr. Gosse into his hand, elevated its crown feathers and bit fiercely at his fingers, seizing and pinching the flesh with all its force, striving at the same time to clutch with its claws, and screaming vociferously.

The fly-catchers belong to this family, and the king-bird, or tyrant fly-catcher of the New World is so bold and has so much intrepidity, that it will attack even a bird of prey, if any such should venture to invade its territories. This bird is, however, in some measure ob-

noxious to the human race, on account of his great love of bees; for he will take up his abode on a post or a fence in the vicinity of hives, and will make continual sallies on their industrious tenants as they pass to and fro. The tyrant fly-catcher is, therefore, much disliked by the American settlers, who depend greatly upon their honey as a substitute for butter, which is generally scarce, from the want of herbage for their cows.

The curious group of birds called the chatterers, are famous for their enormous appetites, as one species is said to have gorged itself with apples till it was suffocated; and another (the European waxwing,) was found to have crammed itself with holly berries till it could scarcely fly. The cedar bird, or American chatterer, is very handsome, from the scarlet wax-like ornaments of its wings.

The *campanero* or bell-bird, the song of which is like the tolling of a bell, Mr. Waterton observes, "is about the size of a jay. His plumage is as white as snow. On his forehead rises a spiral tube, nearly three inches long. It is jet black, clothed all over with small white feathers. It has a communication with the palate, and when filled with air, looks like a spire; when empty, it becomes pendulous. His note is loud and clear, like the sound of a bell, and may be heard at the distance of three miles. In the midst of these extensive wilds, generally on the top of an aged mora, almost out of gun reach, you will see the *campanero*. No sound or song from any of the winged inhabitants of the forest—not even the clearly-pronounced 'whip-poor-will,' from the goat-sucker—causes such astonishment as the toll of the *campanero*. With many of the feathered race, he pays the common tribute of a morning and an evening song; and

even when the meridian sun has shut in silence the mouths of almost the whole of animated nature, the campanero still cheers the forest. You hear his toll, and then a pause for a minute; then another toll, and then a pause again; and then a toll, and again a pause. Then he is silent for six or eight minutes, and then another toll, and so on. Actæon would stop in mid chase, Maria would defer her evening song, and Orpheus himself would drop his lute, to listen to him, so sweet, so novel, and romantic is the toll of the beautiful snow-white campanero. He is never seen to feed with the other cotingas, nor is it known in what part of Guiana he makes his nest." Another nearly allied bird is called the blacksmith, from its peculiar cry, which sounds like the clinking of a blacksmith's hammer; and another, the *cephalopterus*, has its head adorned by a very peculiar tuft of feathers, which rises upwards, and then spreads around, slightly drooping downwards on every side, like a parasol; and another expanded and lengthened set of plumes hangs like an apron from the chest. The prevailing colour of the plumage is a deep black, having a metallic lustre. A stuffed specimen of this curious bird is in the museum at Paris, which is said to have been brought from Brazil; but, as naturalists have since frequently sought for it in vain in that country, it is probable that it came from some other part of South America.

The thrush family, including the blackbird, are all remarkable for the sweetness of their song. The American mocking-bird, which is a kind of thrush, is remarkable for the ease with which it imitates the notes of other birds. While thus exerting himself, a stranger might suppose that the whole of the feathered tribes

had collected together in one spot, so perfect are his imitations. He often deceives the sportsman, making him believe that birds are close to him, which are, in fact, many miles away, "but whose notes he exactly imitates. Even birds themselves are frequently deceived by this admirable mimic, and are decoyed by the fancied calls of their mates, or dive with precipitation into the depths of thickets at the scream of what they suppose to be the sparrow-hawk."

The water-ouzel, a British bird, is remarkable for the strange situations it fixes on for building its nest. It is usually placed, Sir William Jardine informs us, beneath some projecting rock on the banks of a mountain stream, "and often where a fall rushes over, through which the parent birds must dash to gain the nest, which they do with apparent facility, and even seem to enjoy it. At night they roost in similar situations, perched, with the head under the wing, on some little projection, often so much leaning over as to appear to be hanging with the back downwards."

The menura, or lyre bird, is remarkable for the beauty of its tail, which resembles in form the musical instrument called a lyre. It is a native of Australia.

The satin bower-bird is also found in Australia, where it builds itself extraordinary bower-like structures under the shelter of some overhanging tree. The base of the bower consists of a sort of platform of sticks thickly interwoven, on the centre of which the bower is built of sticks and twigs, the tips being arranged so as to curve inwards, and nearly meet at top. The most curious part, however, of this bower, is the manner in which the entrance to it is decorated with the most gaily-coloured articles that can be collected, such as the blue

tail-feathers of parrots, bleached bones, the shells of snails, &c.; some of the feathers are stuck in among the twigs, while others, with the bones and shells, are strewed about near the entrances. The propensity of these birds to pick up and fly off with any attractive object, is so well known to the natives, that they always search their runs for any small missing article, as the bowl of a pipe, &c., that may have been accidentally dropped in the bush.

The sand martin is remarkable for the curious manner in which it builds its nest. It chooses the face of a sandstone rock, and in this it makes holes which are sometimes deep enough to take a man's arm up to the shoulder without reaching the bottom. This bird has a very ingenious manner of building its nest. Rennie says he has seen "one of these sand martins cling with its sharp claws to the face of a sand-bank, and peg in its bill as a miner would do his pick-axe, till it had loosened a considerable portion of the hard sand, and tumbled it down amongst the rubbish below. In these preliminary operations it never makes use of its claws for digging; indeed, it is impossible it could, for they are indispensable in maintaining its position, at least when it is beginning its hole." He also observes, that the holes of some of these swallows are as nearly circular as if they had been drawn with a pair of compasses. The bird begins in the centre, and works outwards, changing its position continually, and it is as often hanging from the roof, with its back downwards, as standing on the floor. When the hole is of considerable depth, the bird "always scrapes out with its feet the sand detached by the bill; but so carefully is this performed, that it never scratches up the unmined sand, or disturbs the plane of

the floor, which rather slopes upwards, and, of course, the lodgment of rain is thereby prevented." There is a whole colony of these swallows in the sand-banks near Woking, in Surrey; and there are others in various parts of Great Britain, from Devonshire to the north of Scotland.

The goat-sucker was formerly supposed to suck the milk from goats, and was dreaded and driven away as a robber by the farmers and cottagers who kept these animals; but Mr. Waterton, who is pre-eminently the champion of all ill-used and libelled animals, because he judges from what he sees, and not from what he reads, has ably vindicated the poor goat-sucker, and thus defends him from his enemies:—"When the moon shines bright, you will have a fair opportunity of examining the goat-sucker. You will see it close by the cows, goats, and sheep, jumping up every now and then under their bodies. See how the nocturnal flies are tormenting the herd, and with what dexterity he springs up and catches them, as fast as they alight on the body, legs, and udder, of the animals. Observe how quietly they stand, and how sensible they seem of his good offices; for they neither strike at him, nor hit him with their tails, nor tread on him, nor try to drive him away as an unwelcome intruder. Were you to dissect him and inspect his stomach, you would find no milk there. It is full of the flies which had been annoying the herd." The mouth of the goat-sucker is very curiously constructed: it is very wide, and fringed with long hairs, which act like the baleen of the whale, and do not suffer one of the insects which have entered the mouth to escape. The goat-sucker has a very curious claw on one of his feet, which is toothed like a comb. The use of this claw was long unknown, but it is now found that the bird employs it to comb out the hairy

fringe of the beak, as otherwise it might become entangled, so as to prevent the bill from opening, or, at any rate, it would lose its efficacy.

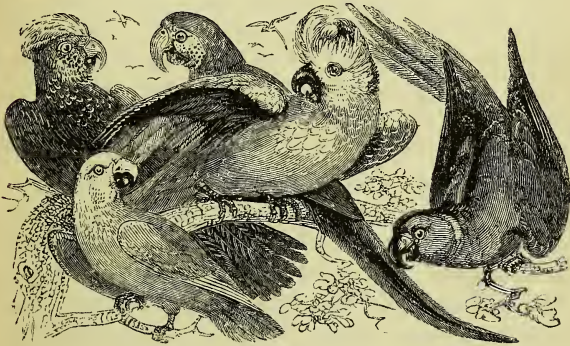
The beautiful little humming-birds have been compared to feathered gems, so exquisitely rich and varied is their plumage; but Europeans, that have only seen their stuffed skins in a museum, can scarcely form any idea of their extreme beauty in a state of nature, when they dart about from flower to flower like bees rather than birds, "poising themselves in the air while they thrust their long extensile tongues into every flower in search of food." While they thus hang, they quiver their delicate fairy-like wings with the utmost rapidity, and it is said that "the humming noise which they produce proceeds entirely from the prodigious velocity with which they vibrate these tiny organs, by means of which they will remain in the air with their bodies almost motionless for hours together." Wilson says, that when a humming-bird suspends himself before a bunch of trumpet flowers in bloom, his wings become invisible, or like a mist, from the rapidity with which they quiver. Beautiful and delicate as these little creatures are, however, they are said to be often under the influence of evil passions, and one lovely little species, called the Mexican star, has been described as showing violent paroxysms of anger. On these occasions, "it will attack the eyes of the larger birds, striking at them with its sharp needle-like bill." Sometimes, particularly during the breeding season, the humming-birds quarrel with each other; and when this is the case, their mutual wrath becomes immeasurable; their throats swell; their crests, tails, and wings, expand; and they fight in the air till one or the other falls exhausted to the ground.

The king-fishers are remarkable for the beauty of their plumage, and the European king-fisher, which haunts the banks of lakes and rivers, looks almost as brilliant as the humming-birds of South America, when it darts on the small fish, on which it preys, "with the rapidity of an arrow, plunging its little gem-like body for one flashing moment in the crystal stream." The giant king-fisher of New Holland is called by the colonists the laughing or feathered donkey. Nothing can be more peculiar than the cry of this creature, which exactly resembles the peculiar gurgling laugh that a donkey might be expected to utter if one could conceive that animal indulging in a fit of merriment; and as one seldom laughs without being accompanied by another, who seems anxious to join in the duet, the effect is irresistibly ludicrous. This bird is respected by the Australian gardeners for destroying grubs and mice; and it has also been found to devour snakes, having first killed them by a violent blow on the back of their heads with its beak. One of these birds was seen sitting on the branch of a tree near a river, looking so stupid, and nodding its head in such a singular manner, that the spectators could not imagine what was the matter with it; but on being examined, "it was found that this peculiar manner proceeded from its having swallowed a small snake, which had got into the stomach, throat, and bill, but had not yet accommodated itself in the former's cavity."

CLIMBERS.

THE birds belonging to this order have their feet so constructed as to give great power and tenacity of grasp to the feet, whatever may be the position of the body.

“By this peculiar structure, many species are enabled not only to ascend a perpendicular trunk with perfect ease, but to suspend themselves from the lower surface of a branch while searching for their favourite food, which consists of either birds or insects, according to the shape of the bill.”



PARROT, MACCAWS, AND COCKATOO.

The birds belonging to the parrot tribe, whether parrots, lorries, parroquets, maccaws, or cockatoos, have all thick, hard, solid bills, rather short, deeply curved, and generally sharp-pointed, which they use not only to take their food, but to assist them in climbing, suspending themselves indifferently by their feet or bill. The throats of these birds are furnished with three peculiar muscles, so as to make the larynx quite different to most others of the feathered tribe; and it is supposed to be owing to this peculiar construction that these birds are enabled to articulate words. The plumage of all the parrot tribe is extremely gorgeous, particularly that of the scarlet maccaw. “It is a grand sight in ornitho-

logy," says Mr. Waterton, "to see thousands of these birds flying over your head, and near enough to let you have a full view of their scarlet mantles." Lord Anson also gives a very striking description of the scarlet macaws in a wild state, which he saw in the island of Quibo:—"A fine river of transparent water there precipitates itself along a rocky channel, forming numerous falls, and the great disrupted rocks which form its boundary on either side are crowned with lofty forest trees. While the commodore, and those who were with him attentively viewing the place, were remarking the different blendings of the waters, the rocks, and the woods, there came in sight, as it were still more to heighten and animate the prospect, a prodigious flight of maccaws, which, hovering over this spot, and often whirling and playing on the wing about it, afforded a most brilliant appearance by the glittering of the sun upon their varied plumage."

All the parrot tribe are very long-lived, and they not only some of them articulate very distinctly, but they seem to take a kind of pleasure in the astonishment they frequently create by their imitation of the human voice.

The toucans are very curious birds, on account of their enormous bills, which, in some instances, are almost equal in size to the body. At first sight, it seems difficult to conceive how this bird can manage its enormous bill so as either to fly or to take its food; but its bill is so exceedingly light, from being cellular within, that it does not appear to be of any inconvenience to the bird. The tongue is long, narrow, and barbed on each side like a feather, and when one that was tamed by Mr. Vigors was fed, it took the fruit that was given to it, and held it for some time in its beak, touching it two

or three times with delight with its slender feathered tongue, and then tossing it into its throat by a sudden upward jerk. This bird is partly carnivorous, and when a goldfinch accidentally got into its cage, the toucan seized it, and pressed it so suddenly, that the poor little goldfinch only uttered one cry before it died. The toucan then hopped with it to another perch, and stripped off its feathers, after which it broke the bones, and when it had reduced its victim to a shapeless mass, it devoured it.

THE WADERS.

THESE birds are remarkable for the extraordinary length of their legs, which are also extremely slender; and this structure of their legs and feet is admirably adapted for their habits, as it admits of their wading to a considerable depth without wetting their feathers, and of their running with great rapidity along the sand. A variety of curious birds are included in this order, all of which are remarkable for the length and slenderness of their legs.

The lapwing, or green plover, is called the peewit, from its singular cry, which exactly resembles that word. Several stories are told of the ingenuity of this bird, such as its stamping on the ground to make the worms on which it feeds rise to the surface; and the female pretending to be wounded in order to draw sportsmen away from her nest. To attain this end she will run along the ground with one wing hanging down, as if it were broken, till she thinks she has reached a sufficient distance, when she will spread both wings and fly away.

The whooping crane of North America is a stately bird, which, when standing erect, is nearly five feet

high. Its feathers are of a pure white, excepting some of those of the wings, which are black. When wounded this crane defends itself with vigour, and has been known to strike its bill through a person's hand with the strength and sharpness of a dagger. These creatures build on the ground and assemble in vast flocks; and the noise they make when they take flight has been compared to an army of men shouting all together. Mr. Nuttall informs us that once when he was descending the Mississippi in the month of December, he observed the whooping cranes in countless thousands taking their flight towards more genial climates. "The clangour of these numerous legions passing along, high in the air, seemed almost deafening; the confused cry of the vast army continued with the lengthened procession, and as the vocal call continued nearly throughout the whole night without intermission, some idea may be formed of the immensity of the numbers now assembled on their annual journey to the regions of the south."

The heron is a very elegant bird, that will stand for hours by the side of a piece of water, with one leg drawn up, watching for fish. When it flies it flaps its great wings so as to produce a very peculiar sound.

The stork is common in several countries in central and northern Europe, particularly in Holland and Poland. This bird appears to have been regarded with peculiar favour in almost all ages and countries, and wherever it is common its motions are watched with the greatest attention, and evil or good is predicted according to its movements. In Holland the storks build generally on the chimney tops, always returning to the same nest after their periodical migrations; and among

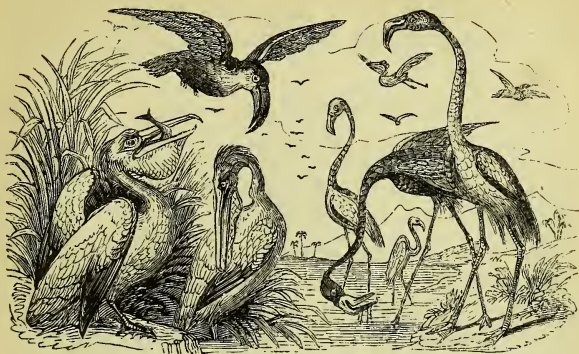
the numerous stories that are told of them are two which are particularly interesting. One is of a poor stork who found the house on which he had been accustomed to build levelled with the ground, and who wandered about for several days in the most disconsolate manner, without thinking of choosing another habitation; and the other is of a female stork, who, at the conflagration of Delft, (in which town she had built her nest,) after repeated but unsuccessful attempts to carry off her young, chose rather to perish with them in the flames than to leave them to their fate, and actually suffered herself to be burnt alive. In Poland it is customary to cut the head off a Lombardy poplar and fix a cart wheel on the remains of the branches that are left, for the storks to build in; as, unless this is done in the neighbourhood of every country mansion, the country-people believe that some misfortune will befall the proprietors.

The woodcock and the snipe feed by inserting the bill deep into the earth in search of worms, which are their favourite food. The bill of the woodcock is most admirably constructed for the functions it has to perform when thus immersed in the soil; for, in addition to its great length, it possesses a nervous apparatus distributed over the greatest part of its surface, so as to give it the sense of touch in the highest perfection, and it is provided with peculiar muscles which enable it to open the tip of its bill only so as to seize anything that it may meet with in the soil. The places haunted by woodcocks and snipes are generally bored all over with the holes made by their bills.

The stilts or avocets have round, slender, pointed bills, and enormously long legs, which are so disproportioned

to the size of the body, that they look as though they were walking on stilts. The history of the European stilt is little known, but that of the North American species has been described at length by Wilson. This bird builds in salt marshes which are broken into numerous pools, but are rarely overflowed by the tide during summer, and which are generally so shallow that the avocets can easily wade through them, and bore the soft mud for the eggs of insects and spawn of fish, on which they principally feed. When the females are sitting, if any person should appear, the males rise rapidly in the air, "flying with their long legs extended behind them, and keeping up a continual yelping note, which sounds like *click! click!*" They will then alight on the bare marsh, dropping their wings, and standing with their legs half bent and trembling, as if unable to support the weight of their bodies. "This singular manœuvre is no doubt intended to induce a belief that they may be easily caught, and so to turn the attention of the person from the pursuit of their nest and young to themselves." It is probably from a similar manœuvre being practised by the common plover, that these birds are sometimes called long-legged plovers.

The flamingoes are very curious birds, which associate together in flocks, feeding upon molluscous animals, aquatic insects, and the spawn of fish, which they procure out of the water by means of their lengthened necks, sometimes turning their bills upside down, to take advantage of its peculiar, and apparently inconvenient form. "They are said to be extremely shy and watchful, and to place sentinels, which, on the approach of danger, give alarm by a loud and trumpet-like cry. They also breed together in inundated marshes, raising their nests



PELICAN, TOUCAN, AND FLAMINGO.

to a considerable height, by collecting the mud into a pyramidal hillock with their toes, after which they brood and hatch their eggs in what may be called a standing posture, their feet and legs being often in the water. The young are only two or three in number, and run almost as soon as excluded from the shell. They sleep standing upon one leg, with the neck folded back upon the body, and the head reclined beneath the wing. They run swiftly, but never swim from choice. The tongue of the European flamingo was much admired by ancient epicures; and Apicius, that 'deepest abyss of wastefulness,' as Pliny calls him, is supposed to have been the first to discover its exquisite flavour." The plumage of these beautiful birds is of a delicate pink; but the most extraordinary part of their formation is the shape of the bill, which is as disproportioned to the neck which supports it, as that of the toucan is to its comparatively small body. This last creature, which is a native of South America, is one of the climbing-birds,

and nearly allied to the parrots (see p. 334). It has a black and scarlet plumage, and a shining black bill.

THE WEB-FOOTED BIRDS.

THE birds of this order are peculiarly adapted for swimming, their feet being generally short, and placed far behind, and their four toes being connected by membranes. They are the only birds in which the neck exceeds the legs in length, and the reason, no doubt, is, that while swimming on the surface of the water they have often to search for their food at some depth.

Some of these birds are most curiously formed, from the large size of their bodies, and shortness of their wings. The grebes, in particular, sport on the surface of the waves, seeming to slide along without any apparent effort, as though they were pursuing each other in a kind of play. On land, on the contrary, these birds are extremely awkward and helpless, and particularly when they attempt to walk, as, when they do so, and chance to fall, they sprawl in the awkwardest manner imaginable, flapping their short wings, and raising themselves with the greatest difficulty.

The guillemots, puffins, and other similar birds, which are so common on cliffs by the sea-shore, have all remarkably short wings, and some of them seem totally "destitute of the faculty of flying, their wings being converted into small, oblong, flattened paddles, or fins, covered with minute scale-like feathers. Their legs are very short, and placed so far behind that they cannot support themselves on land, even in a vertical position, without resting on their tarsi, [or lower legs,] which are flattened somewhat like the foot of a quadruped. Their

life is chiefly spent upon the ocean, and as they possess the faculties of swimming and diving in the highest degree of perfection, they are the most truly aquatic of all birds, and the opposite of the swallows, which are the most aërial. If any bird approaches nearly in structure and habits to a quadruped, the penguins may claim kindred with the seals, which they greatly resemble in their mode of life," going rarely on shore, and when they do, dragging themselves over the rocks in, what appears to us, a most awkward and uncomfortable manner.

The leaping gorfou (*Chrysocoma saltator*) is a handsome bird, about the size of a common duck, which has the upper part of the body black, and the lower white. The head is ornamented with a crest. This bird is common in the Falkland Islands; and it is said to be so stupid, like the Patagonian Penguin and other birds of this group, as to allow itself to be approached and taken without making any attempt to escape. It is remarkably expert at diving, and, as it is generally observed to leap several feet out of the water before it plunges beneath the surface, the sailors sometimes call it the hopping penguin, or jumping-jack. There are several other nearly allied birds which have the same habit of leaping out of the water, either before they dive, or when they meet with any obstacle on the surface.

The storm petrels are curious little birds, which seem incapable of diving, and seldom swim, "but are generally seen flying or gliding over the surface of the waves, mounting upon their ridges, and descending into the hollows, often so close as to seem walking on the water. Hence the name petrel, or Little Peter, bestowed upon them, in allusion to St. Peter's progress on the waves. In stormy weather they frequently fly in the wake

of a ship, to shelter themselves from the wind; and on account of this habit they are held in aversion by sailors, who, imagining them to be predictive of tempests, and in league with witches, bestow on them the opprobrious appellation of 'Mother Carey's Chickens.' Their flight is rapid and buoyant; they breed in holes and crevices of the rocky coasts; and are more numerous in the antarctic than in the northern seas."

The albatross, the noddies, and all the different kinds of gulls, are nearly allied to the storm petrel. The sea-mew, or common gull, is the most abundant of these birds in England; and it is generally seen in great abundance on the banks of the Thames, both in Essex and Kent, picking up any animal matter which may have been accidentally washed on shore. When these creatures are kept in confinement they will feed for a time on bread, but they are never well long together unless they are allowed to ramble about in search of insects and earth-worms. When they are kept at any distance from the sea, they generally contrive to make their escape during the breeding-season to a cliff by the seaside, returning afterwards to their old abode; and in this manner a gull was kept in the Isle of Wight for upwards of twenty years.

Pelicans are distinguished from all other birds by the singular construction of the lower beak, which has a sort of bag attached to it, extending about nine inches down the neck, and may be dilated so as to hold a man's head with ease. This bag the pelican fills with fish, which it either devours itself at its leisure, or with which it feeds its young, and it is supposed that the fable of the pelican feeding its young with blood from its own breast has arisen from this latter circumstance.

Cormorants are often seen on the same cliffs with guillemots and puffins, but they differ from these birds in being able to fly as well as dive; and in being particularly fond of perching on trees. They catch fish in the same way as the pelicans, but the membrane with which their lower bills are furnished is neither so large nor so easily dilated. The cormorants were anciently trained for catching fish in England, a leather thong being tied round the lower part of their necks that they might not swallow the fish they caught; and a similar use is still made of them in China, as will be seen by the following extract from Mr. Fortune's *Travels* in that country in the years 1843, 1844, and 1845.

"The most singular of all the methods of catching fish in China is that of training and employing a large species of cormorant for this purpose, generally called the fishing cormorant. These are certainly wonderful birds. I have frequently met with them on the canals and lakes in the interior, and had I not seen with my own eyes their extraordinary docility, I should have had great difficulty in bringing my mind to believe what authors have said about them. The first time I saw them was on a canal a few miles from Ning-po. I was then on my way to a celebrated temple in that quarter, where I intended to remain for some time, in order to make collections of objects of natural history in the neighbourhood. When the birds came in sight, I immediately made my boatmen take in our sail, and we remained stationary for some time to observe their proceedings. There were two small boats, each containing one man and about ten or twelve birds. The birds were standing perched on the sides of the little boat, and apparently had just arrived at the fishing-ground, and

were about to commence operations. They were now ordered out of the boats by their masters, and so well trained were they, that they went on the water immediately, scattered themselves over the canal, and began to look for fish. They have a beautiful sea-green eye, and, quick as lightning, they see and dive upon the finny tribe, which once caught in the sharp-notched bill of the bird, never, by any possibility, can escape. The cormorant now rises to the surface with the fish in its bill, and the moment he is seen by the Chinaman he is called back to the boat. As docile as a dog, he swims after his master, and allows himself to be pulled into the san-pan, where he disgorges his prey, and again resumes his labours. And, what is more wonderful still, if one of the cormorants gets hold of a fish of a large size, so large that he would have some difficulty in taking it to the boat, some of the others, seeing his dilemma, hasten to his assistance, and with their efforts united capture the animal and haul him off to the boat. Sometimes a bird seemed to get lazy or playful, and swam about without attending to his business; and then the Chinaman, with a long bamboo, which he also used for propelling the boat, struck the water near where the bird was, without, however, hurting him, calling out to him at the same time in an angry tone. Immediately, like the truant schoolboy who neglects his lessons and is found out, the cormorant gives up his play and resumes his labours. A small string is put round the neck of the bird, to prevent him from swallowing the fish which he catches; and great care is taken that this string is placed and fastened so that it will not slip farther down upon his neck and choke him, which otherwise it would be very apt to do."

The snake bird inhabits Brazil and other parts of South America, roosting at night on trees, whence, if any one should approach, it drops suddenly into the water, as if dead, and emerging at a considerable distance, shows only its long slender neck and small head above the surface, which look so much like those of a serpent, that persons not aware of its singular habits would never suppose it possible it could be a bird.

Swans were formerly highly valued in England for the table, and the old cookery-books contain many receipts for cooking them. There are two kinds common in England, the hooper or whistling swan, and the mute swan. The former bred in the Gardens of the Zoological Society in the summer of 1839, and Mr. Yarrell relates a curious occurrence which took place in reference to this brood.—“The cygnets, when only a few days old, were sunning themselves on the margin of one of the islands, close to the deep water. The parent birds were swimming near. A carrion crow made a descent, and struck at one of the cygnets; the old male hooper came to the rescue in an instant, seized the crow with his beak, pulled him into the water, and, in spite of all his buffetings and resistance, held him there till he was dead.” The mute swan is remarkable for its grace and majesty on the water, though it is almost as inelegant as a common goose when it is on land. Though swans are comparatively common, there are many particulars relating to them that are not generally known, and several of these have been remarked by Mr. Waterton, whose close observation of nature has thrown light on so many doubtful subjects of natural history. Among other things, Mr. Waterton mentions a peculiarity in the manner in which the domestic swan builds her nest.—“At

the time that she lays her first egg, the nest which she has prepared is of a very moderate size; but, as incubation proceeds, we see it increase vastly in height and breadth. Every soft material, such as pieces of grass and fragments of sedges, are laid hold of by the sitting swan as they float within her reach, and are added to the nest. This work of accumulation is performed by her during the entire period of incubation, be the weather wet or dry, settled or unsettled; and it is perfectly astonishing to see with what assiduity she plies her work of aggrandisement to a nest already sufficient in strength and size to answer every end. My swans generally form their nests on an island quite above the reach of a flood, and still the sitting bird never appears satisfied with the quantity of materials which we provide for her nest. I once gave her two huge bundles of oaten straw, and she performed her work of supererogation by applying the whole of it to her nest, already very large, and not exposed to destruction had the weather become ever so rainy." In another place Mr. Waterton mentions, that the domestic swan, when free from molestation, passes by far the greater part of its time out of the water. The swans at Walton Hall, indeed, though they have a noble lake of large extent, are seen continually on the grass, where they pick up small snails and other mollusca, and various kinds of grubs. "Many years ago," observes Mr. Waterton, "I allowed one of my swans the full use of both its wings, and great was the gratification which its aërial evolutions afforded me. Its powers of flight were truly astonishing. It visited all the sheets of water for many miles around; and, being very tame, it would sometimes, on its return home, alight within a few yards of me, as I was standing near the margin of the water.

On taking its excursions into the world at large, I would often say to it, in a kindly tone of voice as it flew over my head, 'Qui amat periculum, peribit in illo;' as I too clearly foresaw that foes would lie in ambush for it. At last, I missed my rash and pretty favourite. It had taken wing to the westward one fine morning, and that morning was its last. I looked for its return in vain; and every day my hope grew weaker, as my fears increased. Towards the close of the week, I read in the Wakefield paper that a professional gentleman in the neighbouring town of Horbury had succeeded in shooting a magnificent wild swan, which had previously been observed in that quarter. This made me suspect that my poor swan had fallen by that identical shot, for I never saw it more." Towards the close of April, 1844, Mr. Waterton's favourite male swan swallowed a double eel-hook, to which was attached a shank of twisted wire about a foot in length. "It had descended," says Mr. Waterton, "so low into the gullet, and fixed itself so firmly there, that I saw at once we had no chance whatever of extracting it by the mouth. Knowing that death must inevitably ensue if the hook were not removed in due time, and mistrusting my own operating powers on a living bird, I sent over to Wakefield, and requested the immediate attendance of Mr. Bennett, our scientific family-surgeon. We laid open the gullet to the extent of six inches, and we drew out the hook from this frightful aperture. The wound was then closed by suture, and without any other application the bird was turned loose upon its native element; as we judged it would do better there than if put into confinement. The swan, on regaining its liberty, went to the upper part of the lake, far out of sight, and we saw nothing

more of it till the following day at noon, when it returned to the house, and ate the bread that was offered to it. After this it was in sight every day, and nobody could perceive that it suffered on account of the operation."

When the young are hatched, it is said that the parent bird will sink herself sufficiently low to bring her back on a level with the water, and the cygnets will get upon it when they are fatigued with swimming, or when the current is too strong for them; and in this way the female swan is frequently seen swimming about, and carrying her young ones on her back.

CHAPTER III.

FISHES.

As it has been before observed, that three-fourths of the surface of the globe are covered with water, it is not surprising that this immense space should be peopled with myriads of living creatures, all as admirably adapted to the situations they are destined to fill as the beasts are to the fields, or the birds to the air. Fishes being destined to live constantly in the water, they are furnished with a different breathing apparatus to those animals that are destined to live in the air, and they breathe through gills, beautifully contrived so as to suffer the air to pass freely, and yet to exclude the water. The form of fishes is admirably adapted to force a way through the yielding waters, and they are furnished with fins which act almost like the wings of a bird in aiding their progress. It is obvious, however, that it is impossible for human beings to be so well acquainted with the habits of fishes as they are with those of birds and beasts, as the fish live in a medium not easily penetrated by human eyes; and, indeed, it is supposed that there are many species in the deep waters that have never been seen by human eyes, and are totally unknown. Even of those that have been scientifically described, some species are extremely rare, and of one fish that is known to inhabit the Mediterranean, only

two specimens have been caught in upwards of thirty years; and in both cases the fish were found after a violent storm, which seemed to have thrown them up from the deep recesses in which they generally dwell. It was observed, also, that these fishes had large projecting eyes, probably on account of the depth and consequent darkness of their abode at the bottom of the sea. The number of fishes that are produced every year is astonishingly great, and it is necessary that it should be so, as the large fish must prey upon the smaller ones; for fishes are not like terrestrial animals, some of which live entirely, and others partially, on vegetable productions, and they can only feed upon each other, or on other animals which inhabit the waters. Fishes are divided into two great classes, the first of which includes all the ordinary fishes, or those which have a bony skeleton; while the second class consists of the cartilaginous fishes, or those in which the place of bones is supplied by gristle, and among which, strange to say, are included some of the most ferocious monsters of the deep. The first class is subdivided into two orders, one of which comprises those fishes which have spiny fins, the rays of which consist of straight sharp-pointed bones; and the second contains those fishes which have soft fins, the rays of which are frequently branched or jointed as in the skate.

BONY FISHES WITH SPINY FINS.

THE serranus, which is sometimes caught on the Cornish coast, is perfectly hideous when out of the water, as the spasm which seizes it when it is taken, never passes off, and it is found long after death in a state of rigidity and contortion, with the fins preternaturally erect.

The anthius is a beautiful fish of the Mediterranean, of a ruby red colour, changing into gold and silver, with yellow bands on the cheeks. "This fish appears to have been known to the ancient writers; and it was regarded as sacred by the divers for marine productions, from a fond belief that no dangerous species would approach its haunts. When an individual happened unfortunately to be caught by the fisherman's hook, it was supposed that its companions immediately severed the line by means of their sharp spines."

The weever or sea-cat, sometimes called chanticleer or sting bull, measures about twelve inches in length, and is frequently caught on the Cornish coast; but when taken, it should be handled with great caution. "I have known," says Mr. Couch, "three men wounded successively in the hand by the same fish, and the consequences have been in a few minutes felt as high as the shoulder;" and such is the dread which is entertained of this fish, Mr. Yarrell informs us, that our own fishermen invariably cut off the back fin and the side spines "before they bring them on shore: the French have a police regulation, by which their fishermen are directed to cut off all the spines before they expose the fish for sale; and in Spain there is a positive law, by which fishermen incur a penalty if they bring to market any fish whose spines give a bad wound, without taking them off." It is curious enough, that the peculiarities of the weever are alluded to in a poem on the Rivers of England, published in the reign of Queen Elizabeth.

The mailed-cheek fishes are among the most frightful of the smaller inhabitants of the deep, with the exception of the gurnards, which are rather handsome, particularly the common species, which is of a bright

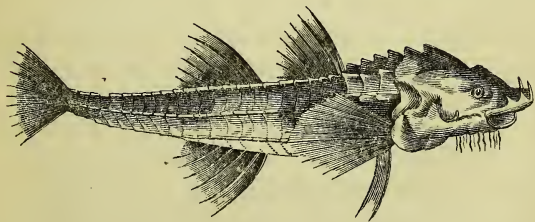
red above, and silvery white below. A kind of gurnard, called the piper, resembles the common species in colour, but it derives its name from a remarkable hissing sound which it produces when caught, by expelling air through its gills. It is found occasionally on the British coast.

The common flying-fish of the Mediterranean is nearly allied to the gurnard, and it is different from the flying-fish of the Atlantic ocean. In fact, there are several fishes which have the power of flying for a short distance, from their side-fins being furnished with a membrane sufficiently large to support the weight of the fish. The flying gurnard is extremely common in the Mediterranean, where it is pursued by the bonitos and dolphins, and from which it endeavours to escape by vaulting into the air, where other dangers await it from the gulls and other similar birds. It must be observed, however, that though it is able to raise itself into the regions of the air, it is by no means capable of a continuous flight, "for the utmost it can do is to describe an arch over the surface of the water, extending to a distance of about 120 feet, and sufficiently elevated for the fish to fall on the deck of a large vessel."

The river bull-head or miller's thumb (*Cottus gobio*) is found in almost all the fresh-water streams of Europe. This fish is remarkable for the large size of its head in proportion to its body, and hence it takes both its popular names, as its head is supposed to bear some resemblance to a miller's thumb, which is always remarkably large from the habit the miller has of trying the fineness of the flour between his thumb and finger. In Russia this fish is used by some as a charm against fever, "while others suspend it horizontally, carefully balanced by a single thread; and thus poised, but allowed at the

same time freedom of motion, they believe it possesses the property of indicating, by the direction of the head, the point of the compass from which the wind blows. In Switzerland the children spear the river bull-heads in shallow water, as they move from the stones under which they hide."

The father-lasher and the sea-scorpion are two other species of cottus. The first takes its somewhat singular name on account of its habit of giving quick and repeated lashings with its tail when thrown on the sand. When touched, it distends its gill-covers, sets out its numerous spines, and assumes a most threatening appearance; but if put into a tub of fresh water, it dies immediately. The sea-scorpion is often confounded with this species, as its habits and general appearance are similar; but it is a much smaller fish.



THE ARMED BULLHEAD, OR POGGE.

The armed bullhead, or pogge, is sometimes called the sea-poacher, from the great activity and eagerness with which it seizes the aquatic insects and small crustaceous animals which constitute its food. It is seldom more than five or six inches long. The head is large and very bony; and the body is defended by eight rows of

strong scaly plates, so that it may be said well to deserve its name of armed bullhead, as it appears as if clothed in a coat of mail.

The sea-locust resembles the sea-scorpion in its general appearance, but it has a strong spine on its cheek, which it projects when offended, so as to make it a dangerous weapon, though in a state of repose it is scarcely perceptible. It is on this account that the generic name of the fish is *Apistus*, from a Greek word signifying perfidious. This apistus is one of the flying fish, and, when the sea is agitated, it occasionally falls into ships. As it is the only flying-fish of the Red Sea, and is extremely abundant along those desert coasts over which the Israelites wandered so long, it has been conjectured that the food mentioned in Exodus, and translated by us quails, was, in fact, the fish in question.

Nearly allied to this fish are several others so hideous that it is wonderful how any human beings can ever have had the courage to eat them. One of these is, indeed, so exceedingly frightful that even the negroes at the Isle of France have christened it the sorcerer. At first sight, indeed, no one would consider it a fish, but rather suppose it to be a mass of corrupted jelly. Its head and body seem enveloped in a bag of thick soft spongy skin, warted and wrinkled all over and irregularly spotted with various tints of brown and grey, which last is sometimes changed to black; but all the tints have a dingy and muddy appearance, and the fish has always a glutinous and disgusting feeling to the touch. The eyes are so extremely small as to be scarcely discernible in the large cavernous head. This frightful creature lives a long time out of the water, and, in fact, it is extremely difficult to kill it. The inhabitants of the Isle

of France regard it rather as a reptile than a fish ; and they fear what they call its sting, that is, the wound inflicted by its spines, more than snakes or scorpions.

It seems strange that the beautiful little sticklebacks should be classed with fishes so hideous as those just described, and yet, when they are closely examined, there will be found many points of resemblance. They have hard cheeks covered with plates of mail, and strong spines with which they fight each other with terrific fury. In other respects they are beautiful little creatures ; the males having green backs, which shine with metallic lustre, and beautiful crimson bodies, with lovely little fairy-like fins, which look as if they were made of gauze, and flutter with inconceivable rapidity when the little creature is pleased. One that was kept by Miss Charlotte Perry, at Godalming, had a very singular habit. He was kept in a glass vase, like one of those used for gold fish, and he was supplied every other day with fresh duck-weed, which, as soon as he obtained it, if the sun shone warmly on his glass, he spread out as a kind of umbrella, but when the sun went in, he collected it together at the bottom of his glass and used it as a kind of bed. When several sticklebacks are kept together in one glass they fight tremendously, and those that are killed, if examined closely, will be found fearfully lacerated by the spines of the survivors. Most of the sticklebacks are river fish, and are natives of Great Britain, but one species, the fifteen-spined stickleback or sea-adder, is found in the sea, on the coast of Norway, as well as in the Baltic.

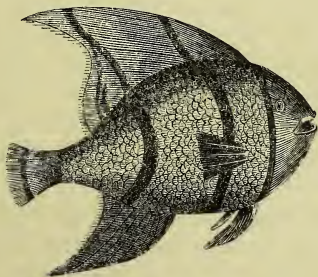
The common maigre, or umbrina, is generally found in the Mediterranean, though it visits occasionally the British Channel. It is eaten, and was formerly consi-

dered a great delicacy for the table. There is nothing very remarkable in the appearance of these fishes, but it has been noticed that when they are swimming in shoals, they utter a peculiar sound, so like the purring of a cat, that some strangers, who were in a boat in which one was deposited, could scarcely be persuaded that they had not a cat on board. The noise may sometimes be heard at the depth of twenty fathoms; and it is recorded that, on one occasion, three fishermen, guided by the sound, dropped their nets so successfully as to secure twenty fine fish at one single throw. The two hard bones usually found just within the sides of the head are remarkably large in these fishes, and were supposed in the olden times to possess medicinal virtues. They were called colic-stones, and were worn round the neck, mounted in gold.

The drum-fish is nearly related to the maigre, and makes a still more extraordinary sound. Mr. John White, an American lieutenant, who, in 1824, published a *Voyage to the China Seas*, relates, that, at the mouth the river Cambodia, he and his crew were greatly astonished by a combination of the most extraordinary sounds they had ever heard, and which seemed to proceed from the sea around and beneath the vessel. These sounds resembled a "combination of the bass of an organ, the sound of bells, the guttural cries of a large frog," and the twanging strings of a gigantic harp. For some time they formed a complete chorus, so loud that the vessel seemed to tremble at the din, but in proportion as they ascended the river the noise diminished, and finally ceased altogether. On appealing to the interpreter, he informed Mr. White that this extraordinary music was produced by a troop of fishes of a flattened oval form,

which, he said, possessed the faculty of adhering firmly to various bodies by their mouths. Humboldt heard similar noises in the South Seas, of which he was unable, at the time, to ascertain the cause; but they were no doubt produced by the fish in question. The scientific name of the fish is *Pogonias*, and one species of it is found in North America.

Some remarkable fishes, which were called by Linnaeus chætodon, from the long slender and hair-like character of their teeth, are natives of the seas within the torrid zone, and they are remarkable for the brilliant colours which nature has bestowed on them with the most lavish hand: deep purple, brilliant rose-colour, azure blue, and the darkest velvet black, all combine to render these fishes almost too resplendent for the eye to rest upon them without pain. Some of them which frequent the shores of the islands in the Indian Seas, "being of moderate size, haunt habitually the rocky



PLATAX.

shores at no great depth of water, and are seen sporting in the sunbeams as if desirous to exhibit their splendid

liveries to the greatest advantage in the blaze of day." Some of them are marked with black velvet-like bands, and one of these, the platax, has these bands carried across its vertical fins, which are more than twice as high as the fish is long.

The most curious fish belonging to this division is, however, the shooting chelmon (*Chelmon rostratus*). This is a small fish, only about six or eight inches long, which feeds on flies and other winged insects, and when it perceives one of these either hovering over the surface of the water or settled on a twig or blade of grass, it ejects against it, with considerable force, a drop of liquid from its tubular snout, which is very long and slender, so as to stun the insect, which generally drops within reach of the fish. When shooting at a sitting insect, the chelmon generally approaches cautiously within a few feet before it explodes the water. In a state of nature, this curious fish is found both on the sea coast and in the rivers of Java; and it is said to be an amusement of the Chinese in that island "to keep the chelmon in confinement in a large vessel of water with a view to observe its dexterity in the practice of its admirable instinct. The Chinese fasten a fly or other insect to the side of the vessel, when the chelmon immediately bombards it with such precision as very rarely to miss the mark." Another species of the same genus, but with a still longer snout, and a Javanese fish, called *Toxotes*, possess the same power. The latter fish is not so curiously shaped as most of the others which delight in shooting; and, indeed, has very little to distinguish it from ordinary fish. It has, however, the scaly fins belonging to the family, and when provoked it has the power of raising an additional fin on the back, which

consists of four strong spines, and will inflict a dangerous wound. This fish does not content itself with shooting a single drop of water at the insects on which it wishes to prey, but it overpowers them by a complete shower of drops.

The vlagman, or flagman, is another extraordinary fish belonging to this division, which is nearly as broad as it is long, and which receives its name from an amazingly long spine at the top of the back, which is almost like a narrow flag or streamer.

The buffalo fish, which has sharp recurved horns, and a very singular protuberance above its head, is also as broad as it is long, as is the zancus. This last fish, "on account probably of its singular form and horned front, has become an object of almost superstitious reverence among the fishermen of the Moluccas. It is alleged, that when they happen to capture one of this species, they immediately salute it by certain genuflexions, and then cast it into the sea." It is, however, an excellent table fish, as it attains a weight of fifteen pounds, and resembles the turbot in flavour.

The sword-fish has nothing extraordinary in the shape of its body, which resembles an enormous mackerel, its distinctive character lying entirely in the lengthened beak or sword-like prolongation of its upper jaw; but this beak is so strong, of such a length, and so sharp, that it forms a powerful weapon of offence, and enables the sword-fishes to attack and overcome the largest marine animals. Many stories are told of this fish; of the blows which it inflicts, and the dreadful combats which it sustains, some of which are probably exaggerated. There is, however, no doubt of its power, and Mr. Yarrell gives a quotation from an account published

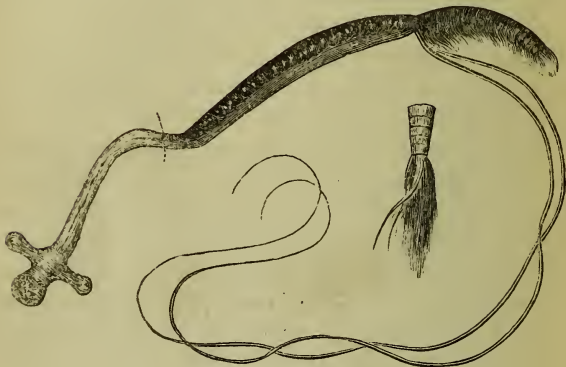
by the captain of a vessel bound to Memel, who states, that near the Hebrides he saw a battle between some of the fish called thrashers and some sword-fish, on one side, and an enormous whale on the other, from which it appears that the captain and his crew (the weather being fine and the water very clear) distinctly saw the sword-fish stab the whale several times in the under part of its body, till the water was quite red with its blood. Daniel, in his *Rural Sports*, states, that a man bathing in the Severn, near Worcester, was struck by, and actually received his death-wound from, a sword-fish. The fish was caught immediately afterwards, so that the fact was ascertained beyond a doubt. There is another and much larger sword-fish in the East Indies, which is called the fan-fish by the Malays, and the sail-fish by the Dutch, because, when swimming near the surface, its back-fin projects like a sail. The strength of these creatures is prodigious, and Sir Joseph Banks had a plank from the bottom of an East Indiaman that was pierced through by a sword-fish with such force that the snout or sword was buried in the wood almost to its base, and the animal itself was killed by the violence of the blow. There are several smaller sword-fish, but those which have been described are the most remarkable.

The scabbard-fishes are quite as singular in their way as the sword-fishes. The common scabbard-fish (*Lepidopus*) is generally from five to six feet long, and not above four or five inches deep. Of course, a fish so long and so narrow must have a very singular appearance. "If we figure to ourselves," says a writer on the subject, "a large and broad ribband of silver, swimming with a wavy motion through the water, and casting from it in its progress the most beautiful reflections of light, we

may form some notion of the general aspect of this creature in its living state." It is very seldom found on the British coast, but a specimen was taken in Salcombe harbour, in South Devon, on the 4th of June, 1808. "It was swimming with astonishing velocity, with its head above water, going, as the fisherman said, as swift as a bird; and it was killed by the blow of an oar." A specimen of the silvery hair-tail, a nearly-allied species, was cast on the shore of the Moray Firth, on the 2d of November, 1810.

The dolphin of the Mediterranean (*Coryphæna hippurus*) differs essentially from the true dolphin (*Delphinus*), which has been before described (p. 305). The coryphæna is supposed to be the fish alluded to, under the name of the dolphin, by the Greek and Roman poets, as it is so remarkable for the beauty of its versatile tints, that it may be regarded as one of the most brilliant inhabitants of the sea; and though it does not appear that it becomes more beautiful in dying, its brilliancy when alive is quite sufficient to have excited the imagination of the ancients. "It is necessary," observes Bosc, "to have seen these fishes following a vessel in troops, to be able to form a proper estimate of their beauty. When they swim embodied near the surface, and beneath the light of a cloudless sky, they seem effulgent with the richest gold, combined with the sparkling lustre of the topaz, the emerald, and the sapphire, and every brilliant hue is in perpetual change, accordant with the vivacity and varied grace of their movements." This dolphin appears to be sometimes attacked by a parasitical crustaceous animal, from the following account given by Mr. Angas:—"Soon after crossing the line, a dolphin (*Coryphæna*,) was killed, on which was found a new and

remarkable parasite, called *Penella pustulosa*. It was buried in the fish near the gills, as far as the junction of the neck with the abdomen. The neck and head, which last is shaped like the hilt of a sword, are transparent, and show the red blood within. The body is of



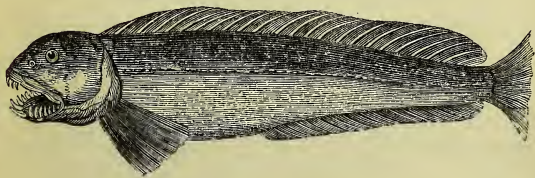
PENELLA PUSTULOSA.

a very dark purple, studded all over with small whitish pustules. The tail is fringed, and just at the point where it is joined to the body are attached two very long slender tubes, through which the creature deposits its eggs."

The tree-climbing fish is so extraordinary in its habits, that we can hardly fancy such a creature to exist. It resembles a common fish, rather thick and clumsy than otherwise, and it was first seen ascending by a fissure in the stem of a palm tree by Lieutenant Daldorff, at Tranquebar. It has since been found to belong to a family of fishes which possess the power of quitting their streams or pools, and creeping for some distance from them, which they are enabled to do by the head being

formed so as to contain cells full of water. This water flows down and moistens the branchiæ or gills, so that—as the principal reason that fish cannot live out of the water is, because when the gills become dry the fish can no longer breathe—these fishes continue to breathe, and, consequently, to live, till all the moisture contained in the head is exhausted. All the species belonging to this family can, accordingly, live a long time out of water; and they can creep about to a considerable distance on land, so as to move from one pond or river to another. There are several kinds of these fishes common in India, but the climbing perch (as it is called, and which has been already described,) is the only one that has been yet found attempting to mount a tree.

The spotted blenny or butterfly-fish, which is found occasionally on the coasts of Dorsetshire and Devonshire, is a curious little fish, not more than three inches long, with an immense fin along its back, spotted like a butterfly, which insect, indeed, it closely resembles when its fin is seen gleaming on the surface of the water.

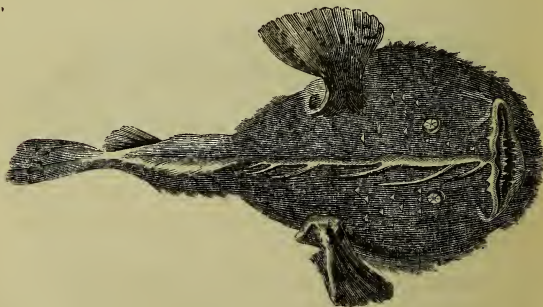


SEA-WOLF.

The sea-wolf, or sea-cat, is frequently found on the north coast of Britain. It is a fearful-looking creature, and its teeth are so sharp and strong, that it has been

known to imprint their marks upon a bar of iron. Fearful as this creature looks, it is eaten by the Icelanders, and its skin is used for making shagreen.

The fishing-frog appears to approach very nearly to a reptile, as its side-fins are so arranged as to form a kind of arm, or rather foot, by which it can drag itself along either on shore, or in the soft mud which occasionally borders ponds and rivers. This curious fish, which is frequently found on the coasts of Great Britain and Ireland, as well as in most other of the European seas, bears on its head two slender elongated appendages, one of which is broad and flattened towards the end, having at this dilated part a shining silvery appearance, and both are curiously articulated at the base, so that they can be moved about by the fish without its moving its body. As the fishing-frog has a most voracious appetite, and cannot move fast, on account of the singular form of its fins, it buries its body in the mud, leaving its curious filaments above water, where one looks like a worm and the other like some kind of butterfly, and



TOAD-FISH.

both serve as a bait to the smaller fishes, who, venturing incautiously near them, are snapped up by the voracious jaws of the fishing-frog, who had artfully contrived this scheme to entrap them. There are several fish belonging to this family, some of which can inflate the body like a balloon, and others are furnished with fearful spines, with which they can inflict dangerous wounds. One of the latter is called the toad-fish.

BONY FISHES WITH SOFT FINS.

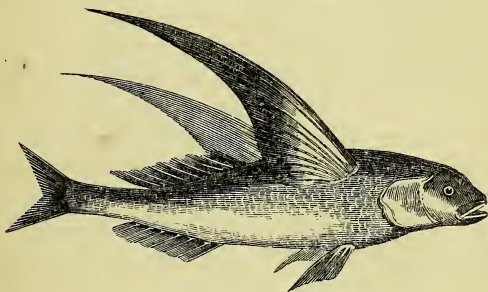
THE carp is a fresh-water fish, and it is perhaps the least carnivorous of its class, as it can subsist on grains, grass, or even on mud. These fish are very long-lived, and though they eat abundantly when they have plenty of food, yet they can subsist an astonishing length of time without nourishment. In the winter, when they assemble in great numbers, and bury themselves among the mud and the roots of plants, they often remain for many months without eating. They can also be preserved alive for a considerable length of time out of the water, if care be taken to moisten them occasionally as they become dry. Advantage is often taken of this circumstance to transport them alive, by packing them among damp herbage, or wet linen; and the operation is said to be unattended with any risk to the animal, especially if the precaution be taken to put a piece of bread in its mouth steeped in brandy! The Dutch preserve carp by suspending them from the roof of a damp apartment in a bag-net filled with moss, which is continually kept moist; and they are fed with vegetables and bread steeped in milk,—a mode of treatment by which they are not only kept alive, but actually thrive and fatten.

The fecundity of these fishes is very great, and they live to an extraordinary age, some being said to be known to have lived 150 or even 200 years. The gold-fish is a kind of carp.

The pike is one of the largest of the fresh-water fishes, as specimens have been found from five to nine feet in length; and one is even said to have been found nineteen feet long, which weighed 350 pounds, and was 235 years old. Pikes are proverbially voracious. "It is," says M. de Lacépède, "the shark of the fresh waters; it reigns there a devastating tyrant; insatiable in its appetites, it ravages with fearful rapidity the streams, the lakes, and the fish-ponds which it inhabits. Blindly ferocious, it does not spare its species, and even devours its own young; gluttonous without choice, it tears and swallows with a sort of fury the remains even of putrefied carcasses." A singular instance of the voracity of this fish is related by Johnston, who asserts, that he saw one killed which contained in its body another pike of large size; and the latter, on being opened, was found to have swallowed a water-rat. The pike is found in all the fresh waters of Europe, Asia, and North America; but it seems to flourish most in temperate climates. The gar-fish or sea-pike is very long in proportion to its breadth, and its bones are remarkable for their fine green colour.

The true flying-fish, or the flying-fish of the ocean, (*Exocetus*), belongs to this division, but, like the flying gurnard and other fish of the same kind, it is not capable of a continuous flight, and it has not the power of rising farther in the air than it can reach at its first leap. In fact, the principal use of the fins is to support the fish in the air like a parachute, after it has leaped from the

water, a power similar to that which the whale and several other fishes are known to possess. In the tropics, the flying-fishes cannot sustain themselves so long as

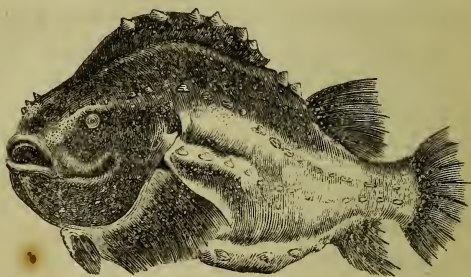


THE FLYING-FISH.

they can in colder regions, as the power of flight depends principally upon the length of time which the pectoral membrane can retain its humidity; and as this is soon evaporated in the heat of the tropics, the membrane becoming dry loses its buoyant power, and the fish falls. In moist weather, on the contrary, the fish can sustain themselves in the air for a considerable time; and "in the night numbers of them may be seen by the phosphoric light they emit, marking their arched passages in apparent streams of fire." Even by day, all voyagers, ancient and modern, agree in the delight which they seem to have experienced in watching the flight of the flying-fish; and Bosc, in particular, describes the flying-fish as sometimes rising in hundreds, and even thousands, around his vessel, and darting over the waves in all directions, scouring away, as Coleridge has beautifully said with regard to another class of animals, like a Tartar troop over the wilderness.

The common salmon, though so well known, has many curious facts in its history. One of these is, its annual visits to a river to deposit its spawn; and another is, the curious manner in which, when on these expeditions, it sometimes throws itself out of the water in order to ascend a cascade. It is a singular fact attending these annual migrations, that the same salmon, which are known by particular marks, are found to visit the same rivers for several years in succession; as one would think that the instinct which leads them to fresh water would make them indifferent as to which they chose.

The lump-fish or sucker is very unwieldy, and as it possesses few means of defence, it generally remains at the bottom of the sea among the rocks. It thus be-

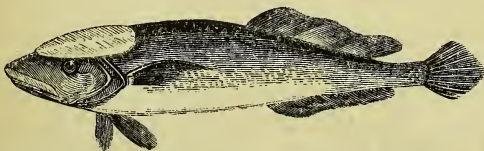


LUMP-FISH.

comes an easy prey both to seals and sharks, and large spots of oily matter are often seen on the surface of the sea above the places where lump-fishes have been seized and devoured. Their skins are also sometimes seen floating empty on the surface of the waves. The lump-fish is one of the very few fishes which appear to take some kind of interest in their young. The unctu-

ous-sucker or sea snail, which is a kind of lump-fish, is remarkable for not only dying, but actually dissolving, soon after it is taken out of the water. It is a British species; but there is another kind which is found in the northern seas, the flesh of which is so bad that even dogs will not eat it.

The remora or sucking-fish of the Mediterranean is remarkable for the flattened disk which it bears upon its head, and by means of which it can adhere to any other body which may chance to fall in its way with considerable firmness. The disk is composed of a certain number of transverse cartilaginous plates di-



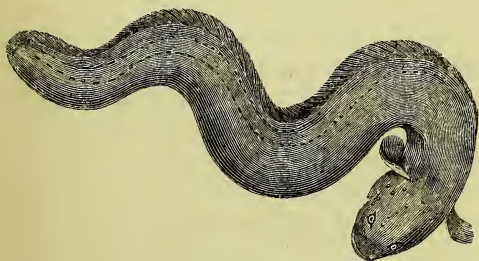
THE REMORA, OR SUCKING-FISH.

rected obliquely backward, which are moveable in such a manner that the fish can create a vacancy between them, added to which they are toothed at the end; so that partly by suction, and partly by these hooked teeth, the fish can fix itself securely either to rocks or floating bodies. These fishes are most common in the Mediterranean, but one was taken near Swansea in 1806 attached to the back of a cod-fish. There are several other kinds of remora, but that which is best known is called the Indian remora, and it is said to be used along the coasts of Mosambique for catching turtles. For this purpose, a ring is first fastened round its tail,

and then a long cord is attached to the ring. "When thus accoutred, the remora, placed in a vessel of seawater, is carried out in a boat; and as soon as the fishermen perceive a sleeping turtle, they row gently towards it, and throw the remora into the water with a sufficient length of cord. It seldom fails speedily to attach itself to the unconscious turtle, which, by the tenacity of its adherence, is immediately drawn towards the boat and captured."

Eels, as is well known, are of an elongated shape, with a thick, smooth, slimy skin. Though eels are generally so well known, many people are probably not aware that they are often in the habit of leaving their fresh water lakes or ponds in the night, and frequenting meadows, for the purpose of preying on slugs and snails. They easily move on land, wriggling through the grass with a motion resembling that of a snake. It is also said that, from the month of November till the end of January, if the frost is not very serious, eels migrate towards the sea. Mr. Jesse, who states this fact, adds, that they do this to deposit their roe, and that the young eels in spring make their way back up the rivers with such eagerness, that at "the locks at Teddington and Hampton, the young eels have been seen to ascend the large posts of the flood-gates, in order to make their way past them, when the gates have been shut longer than usual. Those which climb first generally die, and stick to the posts; others, which get a little higher, meet with the same fate, until at last a sufficient layer of them is formed to enable the rest to overcome the difficulty of the passage." "Near Bristol," he adds, "there is a large pond, immediately adjoining which there is a stream. On the bank between these two

waters a tree grows, the branches of which hang into the pond. By means of these branches the young eels ascend into the tree, and thence drop into the stream in such numbers that the tree sometimes appears quite alive with these little animals." It must be observed, however, that though no doubt Mr. Jesse's observation is correct, and eels do occasionally migrate towards the sea to deposit their spawn, they do not always do so, as they are frequently known to breed in ponds. The conger eel grows to the length of six feet or more, and is as thick as a man's leg. It is extremely voracious, and it is not unfrequently found within the carcasses of dead animals, on which it has been evidently feeding. It is also said in some cases to attack swimmers, by coiling round them and biting them severely.



THE ELECTRIC EEL.

The electric eel (*Gymnôtus électrique*) has the extraordinary power of giving electric shocks to any creature who may touch it, whether a man or beast. These curious fishes abound in the stagnant pools near the town of Calabozo in South America, and the Indians are well aware of the danger of encountering them when their

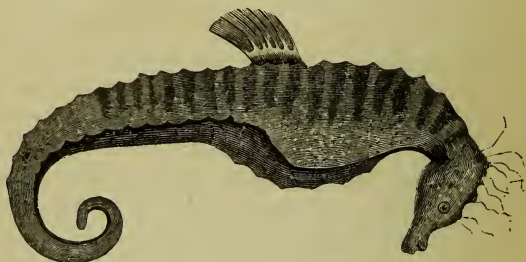
powers are unexhausted. "They, therefore, collect twenty or thirty wild horses, force them into the pools, and when the fish have exhausted their electric batteries on the poor horses, they are laid hold of without difficulty. The horses at first exhibit much agitation and terror, but they are prevented from leaving the pool by an enclosing band of Indians, who goad them with bamboos whenever they attempt to escape." "The eels," says Humboldt, when he is describing a scene of this kind, "stunned and confused by the noise of the horses, defended themselves by reiterated discharges of their electric batteries. For some time they seemed likely to gain the victory over the horses and mules; and these were seen in every direction, stunned by the frequency and force of the shocks, to disappear under water. Some horses, however, rose again, and, in spite of the active vigilance of the Indians, gained the shore, where, exhausted with fatigue, and their limbs being benumbed by the electric explosions, they stretched themselves out upon the ground." "After this commencement," continues Humboldt, "I was afraid that the sport might end very tragically; but the Indians assured us that the fishing would soon be finished, and that nothing is to be dreaded but the first assault of the gymnotus. In fact, whether the galvanic electricity is accumulated in repose, or the electric organ ceases to perform its functions when fatigued by too long-continued use, the eels, after a time, resemble discharged batteries. Their muscular motion was still equally active, but they no longer had the power of giving energetic shocks. When the combat had lasted a quarter of an hour, the mules and horses appeared less affrighted; they no longer bristled up their manes, and their eyes were less expressive of suffering and of terror.

They no longer were seen to fall backwards; and the gymnotes, swimming with the body half out of the water, and now flying from the horses instead of attacking them, began themselves, in their turn, to approach the shore." The gymnotus is by no means fierce or voracious, and its electric organs are the only instruments by which it can either procure its prey, or defend itself against alligators and other animals.

The great pipe-fish, as it is called, is, in fact, by no means large, as it seldom exceeds from six to eighteen inches in length; and its body is very slender. The tubular mouth is the most extraordinary part of this fish, and it is generally from one-eighth to a quarter of the length of the body. The creature feeds on worms, small molluscous animals, and crustacea, which it is enabled, by dilating its throat, to draw up through its cylindrical pipe-like mouth, as water is drawn up the pipe of a syringe. This is absolutely necessary to enable the fish to take its food, as the jaws only open at the extremity of the pipe.

The hippocampus, vulgarly called the sea-horse, belongs to the same family. These very curious creatures have also pipe-like mouths, or rather pipe-like united jaws, with a mouth placed at the end. The common kind is frequently found at Guernsey and the other Channel Islands, and also on the Hampshire coast. Occasionally they are discovered curled up in oyster shells, and on several occasions they have been taken alive, and kept for some days in water. In May, 1835, F. C. Lukis, Esq., a gentleman residing at Guernsey, obtained two of these creatures alive, and having kept them more than twelve days in water, he sent an account of them to Mr. Yarrell, by whom it was inserted

in his *British Fishes*, and from which the following particulars are extracted.—“An appearance of search for a resting-place, induced me,” says Mr. Lukis, “to consult their wishes by putting straws and sea-weed into their vessel, and this has afforded me an opportunity of observing many of their peculiarities. When swimming about, they maintain a vertical position; but the tail is ready to grasp whatever meets it in the water, quickly

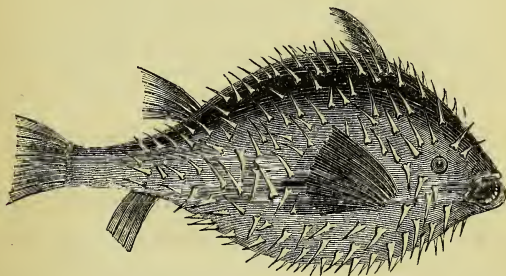


THE HIPPOCAMPUS.

entwines in any direction round the weeds, and, when fixed, the animal intently watches the surrounding objects, and darts at its prey with great dexterity. When both approach each other, they often twist their tails together, and struggle to separate or attach themselves to the weeds; this is done by the under part of their cheeks or chin, which is also used for raising the body when a new spot is wanted for the tail to entwine afresh. The eyes move independently of each other, as in the chameleon; this, with the brilliant changeable iridescence about the head, and its blue bands, forcibly remind the observer of that animal.”

The globe-fishes approach very nearly to the cartilaginous fishes. Instead of teeth, the jaws are furnished

with a substance like ivory, which resembles that which lines the beak of a parrot. Two of the genera possess the singular faculty of inflating their bodies by swallowing great quantities of air. When thus swollen, they roll over and float on the surface of the water, apparently totally unable to direct their course. One of these is



THE PORCUPINE-FISH.

called the porcupine-fish or sea-porcupine (*Diodon atinga*). The generic name of this fish signifies two teeth, as the jaws present but one piece above and another below. The skin is armed on all sides by strong pointed spines, so that, when inflated, the creature bears considerable resemblance to a gigantic burr. These spines are, however, very dangerous; and one species, especially, which is common between the tropics, when taken by means of a hook, exhibits the most ungovernable movements, and as it alternately inflates and compresses its body, and ascends and descends with rapidity and violence, it is extremely dangerous to lay hold of. When it is fished for, the hooks are baited with small crabs. The sea-porcupine no sooner finds itself fairly caught, than it swells up like a balloon. It then utters

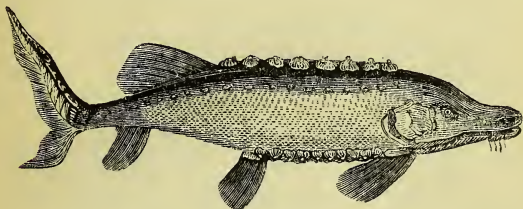
a dull sound like a turkey-cock, and seems to become exceedingly furious. In a short time, however, it has recourse to a very opposite mode of action, by lowering its spines, disinflating its body, and becoming as loose and as flabby as a wet glove. The globe diodon, the sun-fish, and the trunk-fish, are all very curious creatures, nearly allied to the diodon. The sun-fish, in particular, looks exactly as though the head had been cut off a large fish, and thrown into the water without the body.

CARTILAGINOUS FISHES.

THIS division of fishes in some of the genera approaches very nearly to the reptiles. The skeleton is strictly cartilaginous or gristly, being quite destitute of true bony matter. The flesh of these fishes is generally firm and solid, and tastes like veal.

The sturgeon has a small mouth, which is placed below the snout, and, instead of teeth, it has a hard horny substance on each jaw. The nostrils and eyes are on one side of the head; and the muzzle is furnished with four long tendrils, which have much the appearance of worms, and which are extremely sensitive, appearing to answer the same purpose in this respect, as the whiskers of the cat-tribe. There is no appearance of an external ear, but the labyrinth is perfect within the bones of the head. The sturgeons prey upon the smaller fishes, in pursuing which in the sea they exert much speed; but in the rivers they frequent, they are said to search for worms in the muddy bottom, which they explore with their snouts like pigs. The flesh of the common sturgeon when cooked is white and delicate,

and its roe forms the common caviar. A more delicate kind, however, is formed from the roe of the sterlet, the smallest of the European sturgeons, which seldom measures more than three feet long, while the common



THE STURGEON.

sturgeon is seldom found less than six or eight feet in length, and sometimes measures sixteen. The isinglass sturgeon, however, is the largest of the genus, sometimes attaining the length of from twenty to thirty feet, and weighing from 1500 to 3000 pounds. The best isinglass is made from the air-bladder of this species, which is cut into fine shreds.

The polyodon, which belongs to this family, has an enormously long snout, dilated in the middle into something resembling the leaf of a tree; so that when the creature is swimming with its head on a level with the water, its snout looks like a dead leaf floating on the surface.

The sharks do not lay any eggs, but produce their young alive. The white shark is the most common, and the most voracious. This creature is very curiously formed, as its mouth is so far under its upper jaw that it cannot seize its prey without turning on its side. Its voracity, however, is so great that it has been seen to leap out of the water to snatch a piece of meat suspend-

ed from the projecting part of a ship. The shark differs from the other cartilaginous fishes in its jaws being armed with several rows of extremely sharp pointed



THE WHITE SHARK.

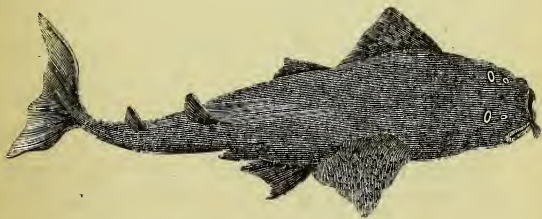
teeth; and the jaws of the white shark are so powerful as to bite at once through the body of a man. The throat is very large, so that it can swallow an enormous mass, and one captured near the island of St. Margaretta is said to have had a whole horse in its stomach. The extraordinary attachment of the pilot-fish to the shark has been often noticed, and it is, indeed, so great that the pilot-fish (which is one of the mackerel family) has been repeatedly seen clinging to a shark while it has been hoisted on deck. It is also well known that the shark, however hungry it may be, never attacks its faithful friend. What the instinct is that produces this attachment is unknown, but probably it depends upon the pilot obtaining its subsistence from the remains of the shark's prey, as the jackal does from that of the lion.

The fox shark or thrasher receives its second name from the immoderate length of the upper half of its tail, and as it has a fin along its under side, it gives the organ some resemblance to a fox's tail. It is this spe-

cies that attacks the whales, which it harasses, by giving them violent strokes with its tail when they rise to the surface for the purpose of breathing.

The hammer-headed shark has a head like a hammer, with an eye on each side. The body is very slender, but it often attains the length of sixteen or seventeen feet. It is found in the West Indies and in the Indian Ocean as well as in Europe, and one species is met with in New Holland. Another species, which is called the heart-headed shark, is found on the coast of Guiana.

The angel or monk-fish is another kind of shark which is very bold and voracious. When captured it



THE ANGEL, OR MONK-FISH.

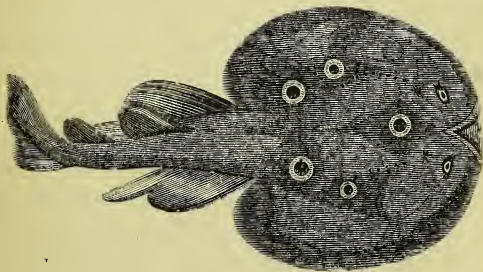
bites with great fury. It preys most on flat-fish. This fish appears to be the connecting link between the sharks and the rays.

The rays or skates are very curious fish, from the thinness and broadness of their bodies, and their narrow tails. In the common skate this tail has more the appearance of that of a calf than of any kind of fish, while the body is triangular. In some parts of England the common skate is called the maid, and in Dorsetshire it is called the tinker. The eggs of these fishes are square, and have a long drawn-out handle at each corner, so

that they look like miniature hand-barrows, with a load in the middle. They are also of a curious dark brown leathery substance, so that when they are thrown on shore by the waves, which is very often the case on the southern coast of Great Britain, no one could possibly imagine that they were eggs who was not previously informed of their nature and peculiar appearance. Those of the common skate, when empty, are very frequently thrown on the beach at Brighton, and the children who pick them up to play with them, call them skate-barrows. The eggs of the dog-fish are still more remarkable, as they are furnished with such curious tassels at each end, that they are frequently called mermaids' purses: they are oblong, of a pale yellowish colour, and semi-transparent; so that those which are not empty shew a faint shadow of the young fish within. The thornback is a species of ray, distinguished by the roughness of its back, and the strong bony oval plates, each furnished with a curved prickle, that are irregularly scattered over both its surfaces. The sting ray is characterised by having the tail armed with a spine, finely notched like a saw on both sides. Mr. Couch, in his MS., says, "this species keeps on sandy ground, at no great distance from land, and in summer it wanders into shallow water, where it is often entangled in the fishermen's nets; and this is the way in which it is generally caught, as it rarely swallows a bait. The manner in which this fish defends itself, shews its consciousness of the formidable weapon it carries on its tail. When seized or terrified, its habit is to twist its long, slender, and flexible tail round the object of attack, and with the serrated spine to tear the surface, lacerating it in such a manner as to produce the most violent inflammation."

Other authors state, that it strikes its weapon into its prey first, and then with its winding tail secures the capture. The eagle or whip ray receives its latter name from the long, slender, and flexible character of its tail, which is sometimes above three feet long, and not thicker than an ordinary whip. This fish is called the eagle ray from the wing-like form of its fins.

The electric ray or torpedo is, however, the most curious of all these fishes. It has the same power of giving an electric shock as the electric eel, and, in fact, it is



THE ELECTRIC RAY, OR TORPEDO.

more violent, as the shock of the torpedo sometimes occasions death. Baron Humboldt informs us, that when a fish was cut through the middle, the fore-part of the body still continued to give shocks.

The bony sucking-fishes, such as the remora, have been already described; but there are others of the cartilaginous family which are quite distinct, and, in fact, approach very nearly to snakes. The tongue is furnished with two rows of small teeth, and this organ, acting like a piston in the circular mouth, is an essential part of the mechanism by which the fish is enabled

to attach itself firmly to stones, or to fasten itself to the larger fishes which it is thus enabled to suck and devour at its leisure. The great sea-lamprey is one of these fishes, which grows to the length of more than three feet. Its colour is yellowish, marbled with brown, and it is generally caught as it ascends the rivers in spring and autumn. The river lamprey or lampern is much smaller than the other kind, and it is caught principally in the Thames and the Severn. It is sometimes called the nine-holed eel, from its having nine small holes on the side of the body. Its colour is a silvery grey.

The glutinous hag or borer closely resembles the reptile called the blind worm. "It enters," says Pennant, "the mouths of other fishes when on the hooks attached to the lines, and totally devours the whole except the skin and bones." In some places it is called the borer, because they say it first pierces a small aperture in the skin, and afterwards buries itself in the abdomen of other fishes. It is most usually found in the body of the cod, or some other equally rapacious fish. The lancelet is a very curious little fish, of which only one specimen has been found, and that was taken by Mr. Couch on the shore near Polperro in Cornwall. "A portion of the tail," Mr. Yarrell tells us, "was sticking out from underneath a stone in a small pool left by the tide. Mr. Couch perceiving it, took it up with some water in the hollow of his hands. It was alive, very active, and so transparent that the viscera were perceivable through the external covering." This fish is extremely rare, and it seems to be the connecting link between the fishes and the slugs or snails.

CONCLUSION.

THE preceding pages are intended to combine amusement with instruction, and to shew young people that there are real wonders in Nature more marvellous than a fairy tale. Another, and more important object has been to raise the mind

“From nature up to nature’s God,”

and to point out how beautifully every creature is adapted to the situation in which it is placed; an adaptation so striking, that it is impossible to contemplate it with indifference. The study of natural objects is, indeed, above all other studies, calculated, not only to excite interest and astonishment, but to impress every thinking mind with a deep feeling of awe and admiration for the Mighty Power by whom they have been created; and when we see the care and foresight that have been bestowed on the formation of the inferior animals, it is impossible to forget that they are the work of the Almighty Being who formed ourselves.

Cause and support of all things! Can we see
Creation’s wonders, and not think of Thee?
The stately beast that stalks across the plain,
The fishes gliding through the watery main,
The birds, with all their varying plumage bright,
And all that glads the heart or strikes the sight;
All are Thy works—part of the wond’rous plan
That rises from the lowest worm to man.

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